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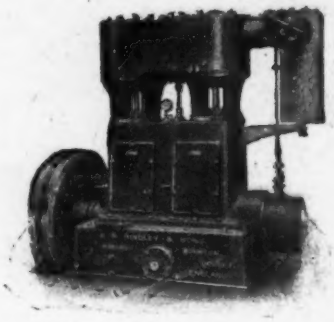

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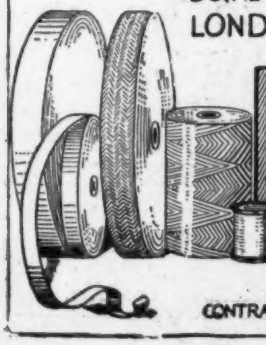

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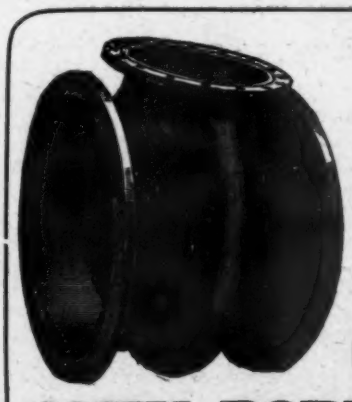

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ELECTRICAL REVIEW.

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TRADE ASSOCIATIONS.

ONE of the most definite and least controversial parts of the report of the Committee on Commercial Policy after the War is that which deals with the formation of trade associations, and the need for such associations is almost universally realised. They can, of course, do some very useful work in many ways. It must not, however, be overlooked that, like every other good thing in this world, they are liable to abuse, and one of the great objections to combinations and associations of all kinds has always been that they would seek to tyrannise over the rest of the community by establishing monopolies or otherwise exercising restraint of trade. A case in point now appears to have arisen.

The Association of British Chemical Manufacturers was formed about a year ago, but not very much had been heard of it until just recently, when it opposed the grant by Parliament of certain powers to electric supply companies which would enable these companies in effect to work up and sell their by-products. The *Chemical Trade Journal* for May 4th says :—

> The Association of British Chemical Manufacturers has scored a distinct success in its brief fight against the proposals in a number of electric power Bills which have been deposited in Parliament this session. The Shropshire, Worcestershire, and Staffordshire Electric Power Co., the County of London Electric Supply Co., and the Gloucestershire Electric Power Co. had clauses in their Bills—which related to the use of certain lands for the erection of electricity generating stations—asking for powers, in addition to the generation of electricity, to manufacture gas and to "produce, work up, convert, sell, and dispose of any material products, matters, and things arising or used in the process of the generation or transformation of energy or power, and any electro-chemical, electrometallurgical, and atmospheric products, and any residual products arising directly or indirectly from the manufacture of gas by the company," to quote from the clause in the Shropshire Bill. Petitions were deposited against all three Bills, but early in the session the Gloucestershire Electric Power Bill was withdrawn. The Association's case against the grant of general and wide powers of this description was that they are quite unprecedented and entirely outside the scope of an electric supply company, and if sanctioned and exercised would enable electric supply companies to compete with members of the Association, under favoured conditions, in the manufacture and sale of chemicals. The powers in question would enable electric supply companies to convert the residual products resulting from the manufacture of gas, either alone or in combination with other chemicals and products, into various chemicals, and also to manufacture other chemicals and sell them in the open market in competition with ordinary chemical manufacturers, who have sunk large capital sums in the erection of plant and in the establishment of their businesses. Furthermore, it is urged that no public advantage can be shown which would justify the grant of the powers in question.

It will be seen that the grounds on which the Association bases its opposition are (1) the proposed powers are unprecedented ; (2) they are entirely beyond the scope of electric supply companies ; and (3) no public advantage will accrue. To talk about precedent in these days is ludicrous in the highest degree, since all precedents have now been thrown to the winds. Even in normal times a slavish adherence to precedent was an infallible sign of weakness and timidity, but in these unprecedented days it is a good deal worse. Then, in the second place, it is urged that the powers in question are beyond the scope of supply companies. Is it seriously urged that a body of men representing, or pretending to represent, one industry, should presume to dictate to another industry what are its proper bounds and limits ? The electric supply companies are to be prevented from

engaging in an entirely legitimate and subsidiary enterprise closely bound up with their main operations, first, because it is unprecedented, and secondly, because it is beyond their scope! It would be interesting to know if the chemical manufacturers would wish to be debarred from certain enterprises involving the working up of by-products merely because it might be unprecedented; and also whether they would wish the power companies to define for them the exact scope of their operations, beyond which they must not go because it might be unprecedented.

But the most amazing part of this extraordinary exhibition of short-sighted selfishness and petty tyranny, attempting to establish a partial monopoly, is the third argument adduced—namely, that no public benefit can be shown. Why, then, does the Association object?—for if no public benefit can be shown, this can only mean that the products in question cannot be supplied by the power companies at a cheaper rate. But almost in the same breath the Association is bemoaning unfair competition. If the power companies can supply these products more cheaply than some of the chemical manufacturers, so much the better for the public; and in this case it is absurd to pretend that no public benefit can be shown. In any case, folly could hardly go further than to pretend that the power companies should not be given an opportunity of extending their operations, and showing a very welcome spirit of enterprise, and selling these products more cheaply—merely because it might be unprecedented and beyond their scope. The first two alleged arguments then are no arguments, and the third, if there is anything in it, works against the Association to its confusion rather than its justification. Moreover, these products are in many cases the raw materials of other chemical industries, and to this extent the Association would apparently penalise one branch of chemical industry in favour of other branches.

It seems clear, therefore, that some of these Associations, at all events, may abuse their powers and seek to further their own interests to the detriment of other industries or the nation as a whole, and some sort of control is certainly needed. If Parliament cannot exercise this control, then it should be the business of some great national body to see fair play and put a stop to unwarrantable interference and attempts to impose restraints of trade and limitations on legitimate enterprise. It is the Associations and not the electric power—or other—industries that require to have their scope and activities strictly limited and clearly defined.

The I.M.E.A. Meeting.

THE meeting of the Incorporated Municipal Electrical Association, which was held at Manchester, last week, was one of the most important in the history of that body; for upon the attitude of the Association towards the Report on Electric Power Supply depended in a large degree the fate of the measure which it foreshadowed. The interests of the members are intimately bound up with the industry dealt with in the Report, and as Mr. Pearce pointed out in his extremely able commentary, there was not one of them who would not be more or less directly affected by its proposals; how, then, would they regard it—from the point of view of the national welfare, or from that of conservatism and supposed self-interest? But we hardly need put the question; the Association is all-British, "militantly British," and the verdict was never in doubt for a moment. Criticism there was in abundance; but it was mostly friendly criticism, and the sense of the meeting was unmistakably in favour of the Report from the first. It was bitterly hostile, however, to the Report on Coal Conservation, which was only mentioned to condemn it as anti-municipal, fallacious, and otherwise highly objectionable.

The fundamental principles embodied in the Report on Electric Power Supply—namely, State ownership and management by District Boards under the supervision of permanent Commissioners—were accepted practically unanimously, though the financial proposals came in for a good deal of criticism, and the constitution of the District Boards was considered capable of improvement. The immense responsibility imposed upon the Commissioners prompted the suggestion that a larger number than three, or even five, should be appointed, and it was pointed out that all of them ought to devote their whole time to their duties, lest any should have private axes to grind. The "flexibility" of the Report was generally commented upon, but this is really a valuable quality, as it enables the Commissioners to cope with almost any imaginable set of circumstances on common-sense lines without exceeding their powers. Naturally, the question of compensation for displaced officials came under consideration, and the engineers of some of the smaller undertakings showed some anxiety as to their future prospects; but, as we have already urged, and, as was pointed out by some of the speakers, they need have no fear on this score. They surely do not wish to spend their lives in small stations, and in view of the coming developments, there will be plenty of openings for them "higher up." We quite agree, however, with the contention that the compensation clause should not be merely permissive, as it stands at present, but obligatory.

The question whether "super-stations" of more than, say, 100,000 KW. were inherently more economical than smaller stations was raised, and not unreasonably; in this connection the statement of a Canadian correspondent in our last issue is worthy of attention. It was also pointed out that in many industries which require steam for heating and other purposes, electrical energy could be obtained almost as a by-product, and certainly at very low cost. The problem of utilising the immense quantities of heat which are at present deliberately thrown away in the cooling water was referred to; in our opinion, this matter calls for the closest investigation. The true importance of cheap electricity to industry was challenged, in view of the very small proportion of the cost of power to selling price of manufactured goods in many branches of industry, and it was urged that in point of fact the saving of coal was even more important to the nation than the reduction in cost of energy; another important matter was that an abundant supply of power should be obtainable, and that it should be extended to the country as well as the town.

For the many other interesting points that were raised, we must refer our readers to our report of the three-hours' discussion. Turning to the business meeting, we would call attention to the decision to form local centres, and the instruction to the Council to approach the Committee on Production with regard to the applicability of the war bonus to chief engineers. Lastly, as evidence of the importance attached by the meeting to the Report on Electric Power Supply, we may add that the Association has decided to meet again directly the draft Bill of the Board of Trade is published.

Substitutes for Overhead Copper Conductors in Germany.

THE seizure of large quantities of copper in Germany for war purposes has rendered the maintenance of the overhead-conductor systems a matter of difficulty. A writer in the *Elektrische Kraftbetrieb und Bahnen* for March 24th, 1918, discusses the best method of maintaining the overhead wires in running condition under such circumstances. In a double-wire system an iron wire can be substituted for one of the copper conductors, the conductivity of the iron wire being improved by connecting it at frequent points to the copper wire. Steps should be taken to keep existing copper wires in running condition as long as possible. Protecting sheaths should be provided at points and cross-overs and at section insulators, at which places wires are subject to breakage by the trolley. Where the wire is particularly exposed to wear, sections of iron wire should be interposed, and the copper wire should be retained only for carrying the current, the iron wire taking the mechanical wear. When copper conductors are not strong enough to be used for trolley contact they should be replaced by iron wires, the worn copper conductor being suspended alongside of the iron wire for the conduction of the current. The trolley wheels must be kept in very efficient running order, so as to prevent sliding friction on the overhead line as far as possible.

A STEEL WORKS ELECTRIFICATION.

Running at the Frodingham Iron and Steel Works, Scunthorpe, Lincolnshire, was a 14-in. three-high non-reversing merchant mill driven through gearing by a single-cylinder engine, the cylinder dimensions of which were 36½ in. diameter by 36 in. stroke, running at 100 R.P.M., and operating at a nominal steam pressure of 90 lb. to the sq. in., but often falling to a much lower figure. The engine was equipped with a 12-ft. 6-in. fly-wheel, having a rim weighing 21,000 lb., and power was transmitted to the mill through gearing with two speed changes. When rolling heavy sections the speed was reduced in the ratio of 29 to 16, but for lighter work, where a higher speed could be used, it was reduced in the ratio of 23 to 22 by changing the gears.

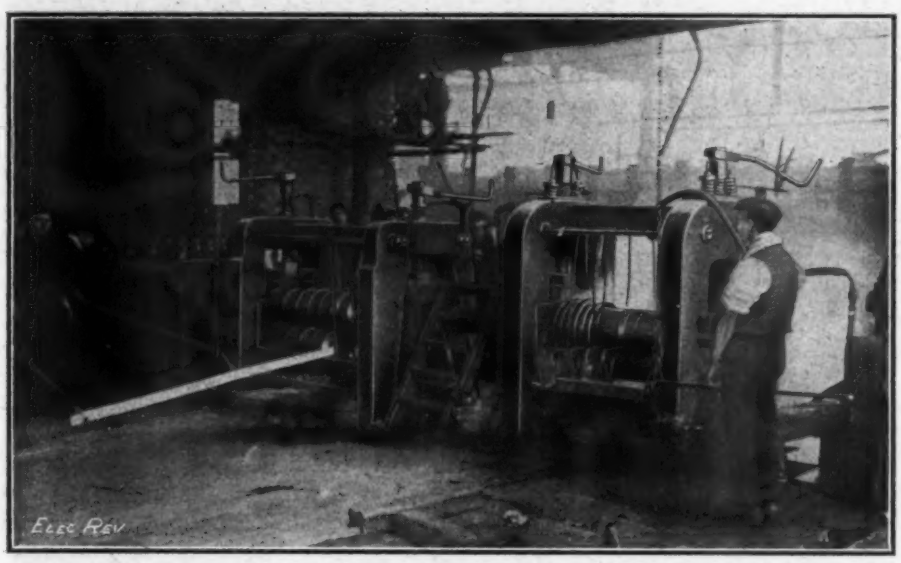

Fig. 1.—Rolling Mill at Work.

The management decided to electrify the mill, with a view to obtaining an increased output. It was decided to supply the mill with sufficient power to roll the heavier sections, and to obtain a wider range of speed variation by means of shunt regulation on the motor without the intervention of the gearing. Moreover, it was wished to include a flywheel sufficiently heavy to reduce the peak loads to below 900 H.P., commensurate with the limited amount of power available. This power was to be obtained from gas engines incapable of overload, and with only 900 H.P. to spare.

To avoid the complications of gearing it was decided that the mill should be driven direct by the motor, the full-load speed of which would in consequence range from 72 R.P.M. for the heavy to 150 R.P.M. for the light sections. To settle the size of the flywheel, a number of tests were made upon the steam mill. Due to the inability of the engine to develop adequate power for the output required, indicator diagrams alone did not afford the requisite information, and the following tests were therefore taken:—The instantaneous drop in speed of the engine and flywheel was measured many times for the heaviest passes in the roughing rolls, and the time of the pass was also taken. From the known weight of the flywheel, the time of pass, and the drop in speed, it was possible to calculate fairly closely the power required by each roughing pass. Continuous indicator diagrams were taken for all the passes, but particularly for the long finishing pass, occupying 10 or more seconds. During this pass the energy given by the flywheel was only a small portion of the total, and the engine had to exert a torque sufficient to roll out the section without assistance from the flywheel. The horse-power required to do this was obtained from the continuous indicator diagrams taken in conjunction with the speed and time figures.

The tests on the finishing and roughing rolls were taken separately, so that the heaviest loads of each pass could be taken independently, and combined together to give the conditions under which the motor would have to work when rolling sections in both sets of rolls at the same time. Very frequently the engine pulled up under such conditions, so that a reliable estimate of the power needed could only be calculated by combining the results of individual tests. Having obtained the figures for the existing flywheel and engine, it was possible to calculate the amount of compounding, and the size of the flywheell that would be required on the motor. The weight of the flywheel had to be such that it would give out the additional energy required if the heaviest roughing pass occurred during the period of the heaviest finishing pass, with a suitable drop in speed, so that the load on the motor did not exceed the stipulated 900 H.P. In making the calculations, allowance had also to be made for the extra power given out by the motor as it slowed up. Very careful calculations were made, and it was eventually decided to install a flywheel having a stored energy equivalent to 35 tons revolving at a radius of gyration of 5 ft. The calculated figures agreed very closely with the results obtained; the maximum horse-power required was actually about 10 per cent. below the calculated figures.

It was decided to install a continuous-current, compound-wound, interpolar "Witton" motor, capable of developing 750 B.H.P. as a normal continuous load with a temperature rise not exceeding 72° F. after six hours' run at 72 R.P.M. The motor was so compounded that it had a drop of 20 per cent. between no-load and full-load. A diverter was provided so that the amount of compounding (and consequently the drop in speed) could be instantly adjusted on the switchboard to suit the best conditions of rolling. Further, the motor was so designed that the speed could be increased by shunt regulation up to 180 R.P.M. at light load.

The motor was coupled to a flywheel having a total weight of about 45 tons, and approximately 12 ft. 8 in. in diameter. To give ample strength, this flywheel, which was of the disk type, had an additional cast-steel rim about 12 in. deep shrunk over the outer periphery, bringing up the weight to the figure mentioned above. The stored energy of the combined armature and flywheel amounted to about 3,650,000 lb. at 100 R.P.M. The motor and flywheel were combined into a three-bearing set, the centre bearing being extra large, so as to take the combined weight of the armature and the flywheel. The bearings, which were lined with special white metal, had oil-ring lubrication, and, in addition, overload flood lubrication from a small pump, belt-driven from the motor shaft. The flywheel shaft ran in the two outer bearings at one end, and was connected to the motor by means

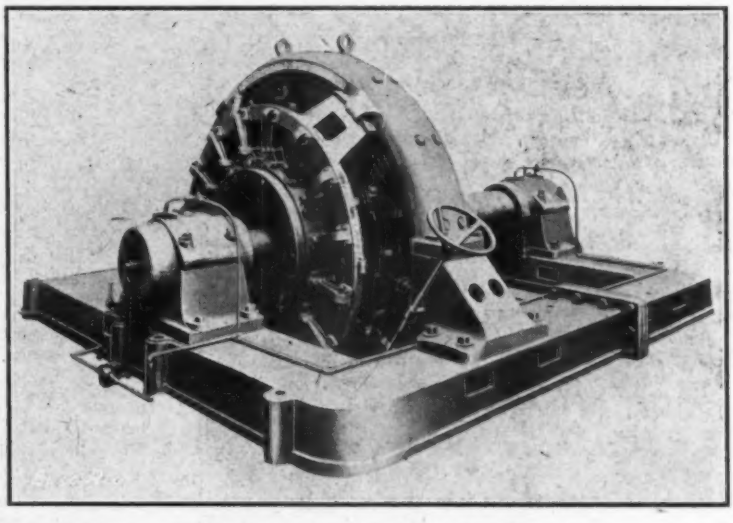

Fig. 2.—750-H.P. "Witton" Rolling-Mill Motor.

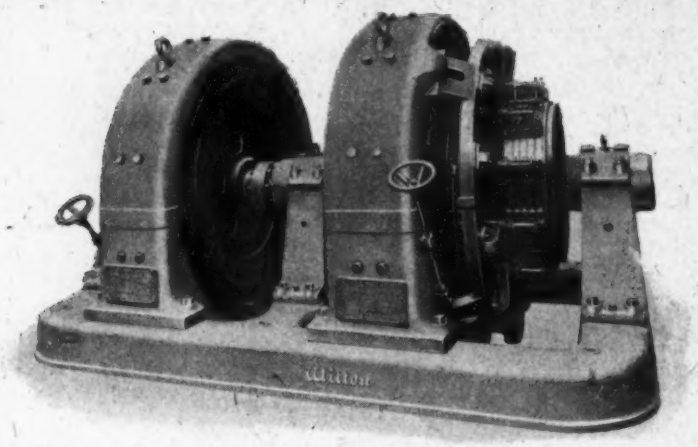

FIG. 3.—750-KW. MOTOR-GENERATOR.

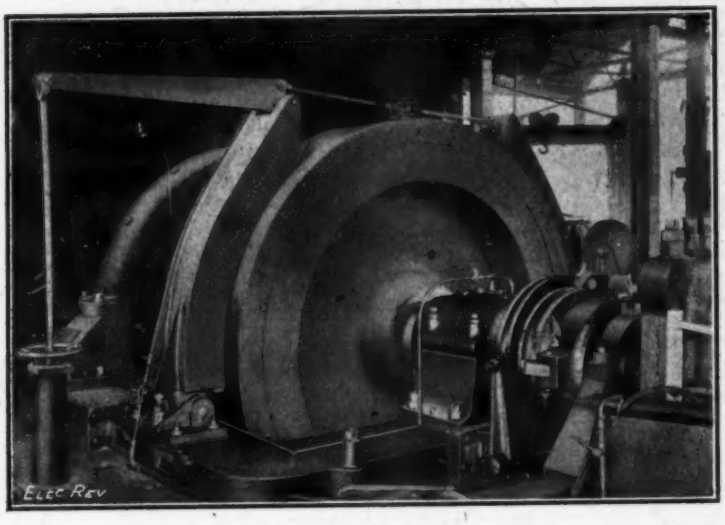

FIG. 4.—A 45-TON ROLLING-MILL FLYWHEEL.

of a solid coupling, forged with the shaft, and bolted to a coupling forming a portion of the armature spider. By this means it is possible to remove the armature without disturbing the fly-wheel or its bearings.

It was decided to make the change from steam to electric drive in as short a time as possible; the engine was dismantled, and the mill restarted, driven by the electric motor, with a total stoppage of only 11 days. To reduce the time required for the stoppage to a minimum, it was proposed to utilise as far as possible the existing

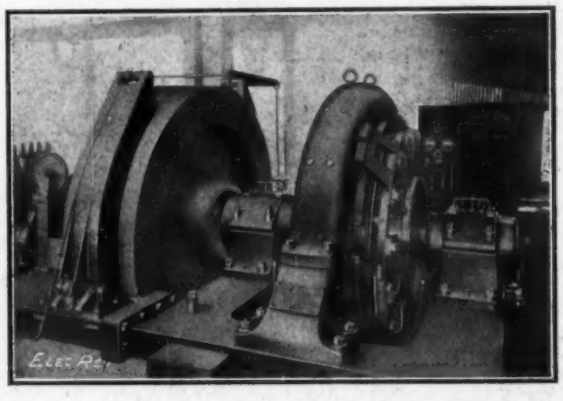

FIG. 5.—ROLLING-MILL MOTOR AND FLYWHEEL AT WORK.

engine foundations, and the bed of the motor was so designed that a number of the existing engine foundation bolts were used for bolting down the motor. The shape of the existing foundation was such that very little alteration was required to make it suitable for taking a three-bearing motor and flywheel. The set was provided with a mechanical disconnecting trip coupling, so that the mill could be instantly stopped while the motor and flywheel continued running. In addition, a water-cooled post-brake with powerful hand-wheel was fitted on the combination bedplate, the brake being arranged to press on the turned surface of the flywheel. The ratio of leverage was so adjusted that sufficient pressure could not be applied to cause dangerous stresses, but the set could be pulled up in between one and two minutes.

The switchgear for controlling the motor consists of enamelled slate panels fitted with ammeter, voltmeter, shunt regulator for varying the speed within the two-to-one limits of the motor, a double-pole main switch, overload and no-voltage circuit-breaker. A switch was also provided for reversing the direction of rotation at a slow speed for emergency use. On the board is mounted a multiple knife-switch diverter for the series windings. Each switch diverts a certain amount of current from the series turns, and thus alters the compounding. When all the switches are closed, the machine practically acts as a shunt-wound machine, with only about 5 per cent. drop in speed between no-load and full-load. The starter for the motor was also mounted on the board, and consisted of a multiple-switch starter with interlock, so that the switches must be closed in the right order.

An interlock was provided between the starter and the shunt regulator, so that the motor could only be started with full field at the slowest speed. After the motor had attained the minimum full speed, the speed could be increased up to the maximum by the shunt regulator as required, but only when the starting resistance had been cut out of circuit. The starting resistance itself consists of heavy cast-iron grids, liberally rated, and capable of starting the motor against 750 H.P. for a period of two minutes. Additional interlocks were provided between the breaker and the starter, so that the breaker could not be closed unless the starter was in the "off" position.

The installation at the Frodingham Iron and Steel Works also includes a large 750-KW. "Witton" motor-generator used for the purpose of coupling together two portions of the works operating at different voltages. The machine converts from 460 to 230 volts, the low-voltage side having a continuous capacity of 7,500 amperes.

The whole of the installation was supplied by the General Electric Co., Ltd., of Witton, Birmingham, and London.

Thanks are due to the Frodingham Iron and Steel Works for permission to take the photographs and to publish this description.

GLOVER'S DETECTIVE AND PROTECTIVE DEVICES FOR CABLES.

IN 1912 Messrs. W. T. Glover & Co., Ltd., Trafford Park, Manchester, designed and patented a cable which entailed the addition to a cable of ordinary construction of a subsidiary or test conductor in the form of a spirally-wound copper tape, surrounding the insulated conductors and insulated from the lead sheath (or from the armour in the case of non-lead covered cables) by a thin layer of hygroscopic insulating material. Any external injury to the cable must entail damage to the insulation of the test conductor before the main insulation is affected. The hygroscopic dielectric between the test conductor and the earthed sheath is made of a minimum thickness to withstand the maximum mechanical damage which may be encountered in laying the cable, and at the same time to have an insulation resistance of the order of 50 to 100 megohms per mile. It will, therefore, be clear that a test of the insulation resistance of this thin dielectric will always give a reliable indication as to the integrity of the lead covering or other waterproof sheath.

The facilities afforded by the test sheath for obtaining definite information as to the internal condition of cables have been utilised, first, for the customary periodical insulation tests on networks and on feeders in vulnerable positions; secondly, for the purpose of keeping a constant watch on the condition of the cable by testing at any desired moment (with the cable "alive") by means of the detective arrangement shown in fig. 1.

These arrangements allow the whole of the dielectric to be explored without the necessity of isolating the cable.

The test conductor is normally connected to earth, switch position (*a*), and by moving the switch to positions (*b*) and (*c*)

respectively, any leakage from the cores is indicated and measured. If no appreciable leakage exists, movement of the switch to position (*d*) enables an insulation resistance test of the test sheath dielectric to be made, and any exterior damage rendered apparent and localised. An incipient fault on a power supply system has actually been located by a fall of potential test along the test sheath whilst the feeder was kept alive and supplied power at 6,600 volts. Slight damage

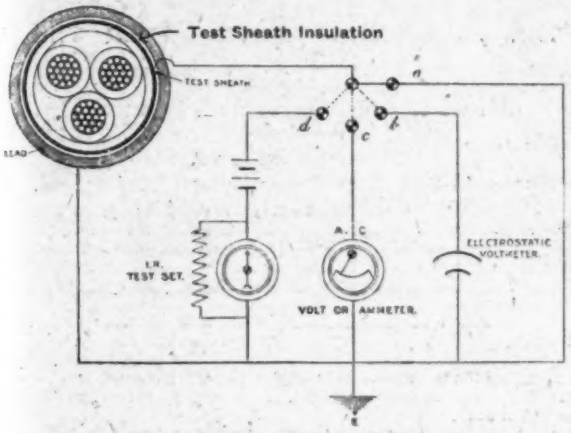

FIG. 1.—GLOVER'S DETECTIVE ARRANGEMENT.

may thus be detected in the initial stages without interruption to the supply, and incipient faults may be located and repaired before serious and widespread troubles have been caused by effects secondary to such damage.

The development of a special protective system for use with the test sheath type of cable has provided a third and much wider sphere of usefulness. This, in combination with

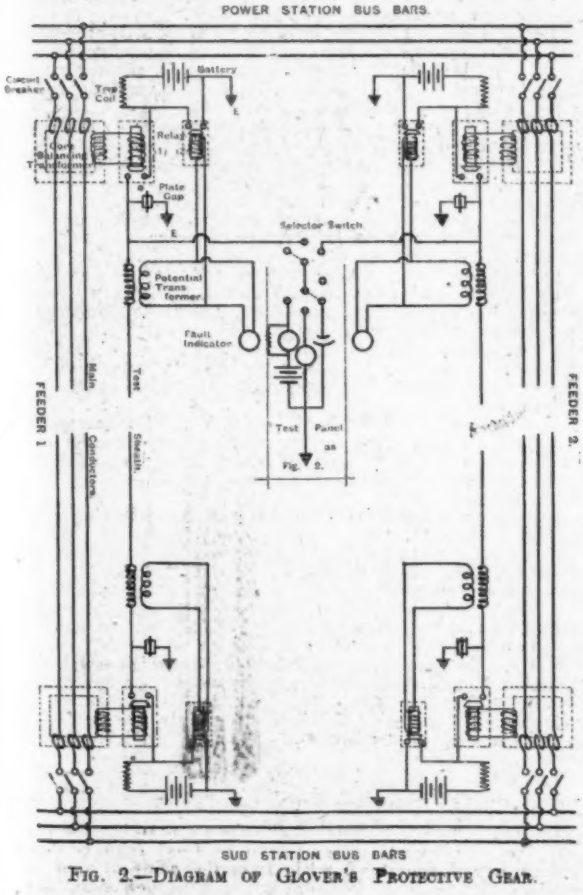

FIG. 2.—DIAGRAM OF GLOVER'S PROTECTIVE GEAR.

the detective arrangements above referred to, has been patented, and is known as Glover's Patent Detective and Protective System.

Fig. 2 illustrates the essential features of this system, and a cursory examination of the diagram will make it apparent that the protective gear is virtually a combination of leakage and core balance protection, and will show how the detective arrangements, together with alarm devices, such as signal lamps or bells, are combined therewith.

It will be seen that the test sheath is connected at each end to the high-tension side of a potential transformer having comparatively low ohmic resistance, but high reactance. The other high-tension terminal of this transformer is connected, first, to one terminal of a contact-maker actuated by an A.C. relay (1) which is connected in series with the secondary of a core-balancing transformer; secondly, to a plate gap, arranged to break down to earth at a predetermined voltage, energising the potential transformer and the relay (2) in its secondary circuit; thirdly (at power-house end only), to a selector switch making connection with an insulation testing panel as shown in fig. 1.

The feeder circuit-breakers are actuated by trip coils of the moving-coil type, energised by a battery or other D.C. source of supply, one pole of which (the *same* pole at each end of the feeder) is connected to earth. Each trip-coil circuit may be completed by either of the two contact-maker relays (1) and (2) mentioned above.

First, assume the case of external damage to the cable penetrating to one of the cores. A heavy current passes from that core to earth, upsetting the core balance, actuating the relays (1). Simultaneously the test sheath is metallically connected to earth, so that the circuit-breaker trip-coil circuits are completed through the test sheath, earth and batteries, causing the circuit-breakers to open, and isolating the faulty feeder. At the same time, the core-balance on any sound feeders (supplying in parallel) will have been upset, actuating the relays (1), but, there being no earth on the test sheaths of these feeders, the trip-coil circuits are *not* completed, and are therefore not energised.

Secondly, assume that there is a leakage from any one core to the test sheath (*e.g.*, at a joint), but that no connection is made to earth. The potential on the test sheath will rise until it reaches a predetermined point at which the plate gaps will puncture, making connection to earth and energising the potential transformers and relays (2). The circuit-

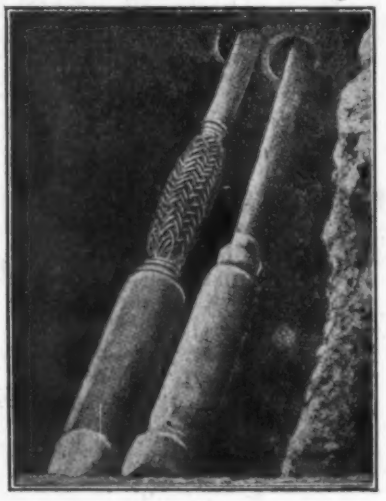

FIG. 3.—PATENT SHEATHED JOINT.

breaker trip-coil circuits are thus completed, and the faulty feeder is isolated.

Joints are admittedly the weakest point in a cable network, so that it is important that these should be "sheathed" as efficiently as the cable itself. Fig. 3 shows Glover's patent "sheathed" joint. The cores may be jointed and insulated in any approved manner. The copper test sheath tape is cut on each side of the joint in such manner as to leave about 1 in. of overall paper exposed between it and the point of splaying out the individual conductors; about 1 in. of copper sheath is left bare, and about another inch of paper is left between this exposed copper sheath and the lead of the cable. The gap in the test sheath is bridged by about a dozen or so small copper wires, insulated with a double braiding of cotton and woven into the form of a cage. This cage work is impregnated with insulating compound immediately before use, and it is slipped over the cable before the conductors are jointed. When this operation is completed, the cage is bound down and sweated at one end. It is then arranged with correct clearance around the conductors, and it will be found that the cage readily assumes a symmetrical position. The wires are then bound down at the other end, and any small surplus on the wires is neatly trimmed off. The lead sleeve is then placed in position over the completed joint, and is plumbed and filled in the usual manner. Thus the electrical continuity of the test sheath is efficiently maintained across joints, the main current-carrying conductors are entirely sheathed by the test conductors at joints, and there is no obstruction to prevent the compound flowing freely around and into all the interstices of the joints.

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Summarised, the advantages claimed for the system are:—Damage is detected *immediately* by insulation resistance tests between the test sheath and lead, and complete breakdown may thus be forestalled. By means of the test sheath, insulation tests may be taken whilst cables are "alive" and in commission. This has the further advantage that the condition of the insulation is observed at *working* pressures and under normal *working* conditions. High resistance faults between core and lead covering may be located by fall of potential tests taken between test sheath and lead. In the event of complete breakdown, the faulty cable is instantaneously disconnected. The device discriminates between sound and faulty cables feeding in parallel, also slight and serious primary damage, indicating in the former and disconnecting in the latter case. Joints are "sheathed" as efficiently as the cable itself.

THE ASSOCIATION OF BRITISH ELECTRICAL ENGINEERS.

A meeting convened by the Birmingham Local Section of the Institution of Electrical Engineers was held at the University, Birmingham, on the 17th inst., to consider the proposed formation of an Association of British Electrical Engineers (Electricity Supply). Mr. S. T. Allen (chairman of the Birmingham Local Section) occupied the chair.

Mr. R. A. Chattock explained to the meeting the objects of the Association, and defined the suggested qualifications for membership. He said the necessity for the formation of an association of this kind had recently been occupying the attention of electrical engineers, and several associations had sprung up for attaining the objects that he had mentioned. It was obviously not desirable to have a number of associations of this kind all working with the same end in view, and the matter was brought to the notice of the Council of the I.E.E., and was very thoroughly considered by it. It was felt that it was highly desirable to co-ordinate the efforts of all these associations, also that if one was selected it would probably have the effect of preventing the others from joining it; it was therefore decided to try and form an entirely new association, which should be backed by the weight and influence of the I.E.E., and which should amalgamate all the existing associations. A body so formed would be exceptionally strong, and it would be able to carry sufficient weight. The objects of the Association could only be attained by negotiations with employers' associations, and the fact that a body like the I.E.E. was in sympathy with the objects of this association, and was actively supporting it, must be of immense value in carrying on such negotiations. The suggestion that members of the association should be corporate members of the I.E.E. was put forward with the idea of ensuring that the status of the members was suitable for occupying positions of responsibility; failing this, some form of examination would probably have to be prescribed which members would be required to pass in order to demonstrate their fitness for responsible posts. There was no doubt that employers would want some sort of guarantee as regarded fitness, and membership of the premier electrical Institution should be amply sufficient, requiring as it did the passing of a technical examination. It was deemed desirable that members of the proposed association should not put themselves in the same category as the working operatives' trade union, where a standard rate of pay was demanded, but no standard of efficiency was offered, or even aimed at. The criticism had been offered that the junior engineers could not afford a subscription to this association and to the I.E.E. as well. This was a very important point, and he wanted to impress upon the audience that if they were going to use the great influence of the I.E.E. in bettering their positions and salaries, it was only fair that they should accord what support they could to that body. There must be hundreds of electrical engineers who were not members of the I.E.E., and if they all joined up, as he felt very strongly they should, they would not only be supporting the I.E.E., but they would be rendering its influence on their own behalf still greater by increasing its numbers. The I.E.E. had been criticised in the past for doing so little for its members. This criticism might have been deserved, but if it had, he could not help feeling that it was entirely the fault of the members themselves for being so apathetic. Now it appeared that some of the members had awakened, and were trying to do something tangible for their fellow members, with the result that they were again being adversely criticised by the very men they were trying to help. The idea underlying the formation of this association was to make it embrace other sections of electrical engineers as well. Each section would have its own council and executive, with representation upon a grand council, which would be closely allied with the Council of the I.E.E. In conclusion, Mr. Chattock moved the following resolution:—"That this meeting of electricity supply engineers, called by the Birmingham Local Section of the Institution of Electrical Engineers, approves the formation of the proposed Association of Electrical Engineers," adding that similar resolutions had been passed in Newcastle, Glasgow, and South Wales.

After a full discussion, the resolution was carried. A resolution was passed recommending that the new association should be associated with the I.E.E.; also that the proposed association should be constituted in the already existing E.P.E.A. Four delegates were appointed to attend the mass meeting to be held in London, viz.:—Messrs. P. T. Burgess, F. Forrest, C. Jones, and J. T. H. Legge.

THE ELECTRICAL TRADES AFTER THE WAR.

Report of the Departmental Committee.

(*Continued from page 582.*)

Section I.—Electricity Generation and Transmission.

As the production of generating and distributing plant forms the chief part of electrical manufacturing it has been necessary to consider whether present methods of generation and distribution are adequate, and if not how they can be improved. The witnesses examined on these points concur in the opinion—

(*a*) That it is of vital importance to every industry to have a free circulation of cheap and efficient power supply.

(*b*) That owing to obstacles caused by the present administrative methods, which they unanimously condemn, the supply has till now been deficient, with consequent serious loss to the nation.

(*c*) That the removal of these obstacles will be followed by a widespread extension in the use of electricity and a greatly increased demand for every kind of electrical plant.

The home demand alone for electrical machinery and apparatus should already have been sufficient to employ a manufacturing industry with at least three times the present output. There is, therefore, urgent need to place electrical energy at the disposal of all manufacturers and at the lowest possible price, which can best be done by the employment of large units in large central generating stations with suitable interconnection between the various areas of supply. This will involve the subordination or discontinuance of the smaller and uneconomical power stations.

The obstacles complained of arise partly from the prevailing official atmosphere, and partly from legislative enactments. In this country the attitude towards electrical progress has been far too restrictive, in contrast with the widespread official and public encouragement of the use of electrical energy abroad. The existing procedure is complicated and responsibility divided.

In the past, lack of foresight in the granting of authority for the supply of electricity has allowed even adjacent undertakings to establish works differing, not only in type of plant and mains, but also in pressures and frequencies, with the result that linking-up and interchange of power is now extraordinarily difficult and costly.

In cases where provision for compulsory purchase has been inserted, in the supposed interest of the public, it is impossible for the undertakings, as the time of purchase approaches, to keep abreast of technical progress or to expend fresh capital to the best advantage. Attention is also called to the anomalous inequalities of tenure as between municipalities, Parliamentary companies, and companies working under Provisional Orders.

The general consensus of evidence is that all matters concerning the development of electrical supply should be placed in the hands of a new and independent Board of Commissioners free from political control and untrammelled by past traditions.

The evidence leads the Committee to the following conclusions:—

1. That Government should recognise the dependence of the State, both from military and industrial standpoints, upon the supply of electrical energy regarded as a "*key industry*."

2. That the distribution of electrical energy should be regarded no longer as a parochial, but as a national question of urgent importance.

3. That the present system of electrical generation and distribution is behind the times, and is a serious handicap in international competition.

4. That the present conditions are mainly due to faulty legislation and to divided, and therefore, weak executive control.

5. That remedial and unifying legislation governing the supply and distribution of electrical energy should be introduced forthwith.

6. That it is imperative that questions concerning the distribution of electrical energy should be freed from political influence, and considered solely from the point of view of national requirements, technical possibilities, and naval and military needs.

7. That co-ordinated and well considered schemes are necessary to enable local developments held over during the war to be handled on proper lines when peace is declared.

8. That the determination of questions concerning concentration of generating plant, with a resulting economy of coal and other savings, requires immediate attention.

9. That only by such steps can the electrical manufactur-

ing industry of this country be fully developed, not only for the home trade, but as a consequence for the great industry now maturing overseas; that the gain to the State from a well-planned scheme of reconstruction will be inestimable; and that the items which are capable of reasonable calculation, such as saving in fuel, reduction in factory costs, and increased output, will together represent not less than £100,000,000 per annum.

Section II.—Electric Traction.

In deliberating on electricity supply on which electrical manufacturing so largely depends, the Committee has had to consider the position of electric tramways and light railways, and, to some extent, the general electrification of railways in the United Kingdom. The output of electrical energy for traction purposes is already nearly 1,000,000,000 units per annum.

Much evidence was given to show that the Tramways Act, 1870, having been framed in the days of animal traction, is long since out of date, that the procedure under the Light Railway Acts, instead of being cheap and expeditious as intended, has proved to be the reverse, and that improved legislation is required. The paralysing effect of the purchase clause in the Tramways Act was illustrated by many cases given in evidence, and frequent reference was made to the report of the Royal Commission on London Traffic (1905), and the recommendations therein on the subject of the local veto.

An acknowledged traction authority urged, in advocating the establishment of an independent Board of Electricity Commissioners, that one of its most important duties should be the framing of a simplified model Bill to replace the Tramways Acts, 1870, and the Light Railways Acts. This model Bill would deal with some of the anomalies and disabilities under which the tramway industry at present suffers—as, for instance, recurring periods of purchase, the incidence of the burden of road repairs, periodical revision of fares, and the settlement of rating questions and running powers.

The Committee concurs with the evidence that unless there be a complete revision of the present powers, the development and growth of tramways and light railways will continue to be impeded, with a consequent reduction in the demand for manufactured products.

The electrification of railways demands consideration from a national point of view. It should be dealt with homogeneously, and not be allowed to develop in a piecemeal and desultory way. A witness of great experience stated that a return of from 10 to 15 per cent. on the capital involved could be secured from the electrical operation of some of our important railway systems. The witness added that the conveniences of electric traction were probably more important than the direct financial results. He was quite satisfied from a thorough investigation of two complete systems (one a very important main line) that electric traction *per se* would pay.

The Committee is of opinion that such an important development as the electrification of railways, which will certainly take place in the near future, should be carried out in accordance with some settled general principle, so that all main or local lines may be properly co-ordinated, and the power stations placed in positions which will have regard to both military and civil needs.

Section III.—Manufacturing.

This section starts by defining "electrical manufactures" as including boilers, turbines or engines, and the electrical generators which they drive, and the mains, instruments, and apparatus connected with the distribution and consumption of electrical energy. It is stated that the manufacture of electrical machinery and apparatus has been, with few exceptions, far from prosperous. "Most of the companies have sustained serious losses, necessitating the writing down of capital. . . . Thirty-two electrical firms with an aggregate initial paid-up capital of just over £15,000,000 have been obliged to write off no less than £3,125,000. . . . Few of such companies have ever earned a satisfactory return on their capital. The notable exception has been cable-making, which has been consistently successful in maintaining its lead, both in the quality of its manufactures and in financial results, and has thus been able to hold its own in the world's markets." "Even allowing for mistakes inevitable at the inception of an industry, and for the rapid advance of electrical science, involving changes in types of machinery, the Committee is convinced that the results would not have been so generally unfavourable but for the hampering conditions peculiar to this country." "On the other hand, the German electrical manufacturing industry has been very prosperous." The report gives in the following table the approximate annual value before the war of the total products of electrical plant, mains, and appliances in Great Britain and Germany respectively:—

	Great Britain.	Germany.
Total electrical products ...	£22,500,000	£60,000,000
Exports	7,500,000	15,000,000
Imports	2,933,000	631,000
Consumption of *home-made* machinery	15,000,000	45,000,000

The approximate annual value of home-made electrical machinery used in Germany before the war per 100 people was about £70, which contrasted with a consumption in this country of only £33.

Of the £22,500,000 manufactured in this country, a large proportion has been produced by concerns under foreign control, and in the case of British exports a proportion is known to consist of foreign manufactures reshipped as British goods. In addition to the legislative obstacles to the full development of the trade, there was another important factor, namely, that in the initial stages foreign countries possessed a pioneering advantage in the fact that their general industrial progress had not then reached so high a degree of development as had Great Britain in the application of steam engineering. Great Britain, on the other hand, had undoubtedly attained great prosperity and technical efficiency in her use of steam plant, and there was therefore less inducement for her manufacturers to adopt electrical driving. On the Continent, however, the introduction of the use of electricity coincided with the advance in manufacturing industries, and there was every inducement to employ the new agent, especially as it did not involve the scrapping of power plant still in good condition. Many of the greatest electrical inventions originated in Great Britain, and there is little doubt that, as in the case of steam, our lead would have been maintained had the prevailing conditions been equally favourable, particularly as this country already possessed ample skilled labour on account of its existing engineering development. Another factor retarding electrical progress in Great Britain has been the strength of the gas interests and the influence they exerted to stifle competition. Again, foreign Governments, appreciating the importance of conserving their home markets as a basis for the development of overseas trade, imposed protective duties, and exerted influence on State Departments to purchase native goods. The German Government has always been ready to help its manufacturers to extend their trade abroad. German diplomacy has been freely placed at the service of German industry, and, when necessary, has not hesitated to exert pressure in the highest quarters. The policy of German manufacturers has been studiously directed not only to secure orders in this country under the open competition permitted by our fiscal system, but also to the effective destruction of British industry. Their business methods have been expressly designed to dominate the markets of the world, to which end they could count on unlimited support from their Government and their banks. An industry cultivated under such encouraging conditions has had an immense advantage in international competition in open markets. Such markets included the United Kingdom, the Dominions of the British Empire, and the South American Republics, whose industries had been largely developed by British capital, especially in the field of railway construction, and German manufacturers have made strenuous efforts to secure and hold those markets.

The importance of a close connection between finance and manufacture cannot be over-estimated. German financiers have always identified themselves with German industries, and it has been their custom, when providing money for a concession or contract, to enforce the use of German-made machinery. This applied not only to the original contract, but to subsequent replacements and extensions, the importance of which in a new and constantly developing field has not hitherto been sufficiently appreciated by British manufacturers and financiers.

Some British companies operating in South America have, owing to the influence of German finance, entirely ceased to purchase British goods. Many instances have been cited, including the well-known case of the Victoria Falls Co., in which orders which ought to have come to Great Britain, were by financial influence secured to Germany. At the outbreak of war, negotiations were in progress for the acquisition by Germany of financial control in existing companies in the United Kingdom, as well as in the British Dominions and India, which, if successfully concluded, would have still further restricted the use of British goods in many parts of the Empire.

Much of the floating finance to enable German manufacturers to secure and carry out their contracts both abroad and in British Dominions, has been provided in London, so that our financiers and discount houses have often found the means by which Germany has fought the British manufacturer.

The Committee has been struck by the thorough organisation of, and close co-operation between, the leading German manufacturers, and by the strength of the links which connect them with the affiliated organisations abroad. There is conclusive evidence of the existence of German control over companies ostensibly British, and that German control has also often been exercised, to the detriment of British interests, indirectly through companies incorporated in America, Switzerland, and other neutral countries. For several years past there has been in Germany a consistent policy of amalgamation and association, and several establishments of world-wide importance have thus been built up. Only two or three German companies are seriously engaged in the electrical business overseas, and the competition which British manufacturers have to face is almost entirely with these houses. But these competitors, though few, have immense resources, with highly trained staffs and competent workmen, their factories are well equipped, they have established branches all over the world, and maintain elaborate research laboratories. They have enormous financial strength, for, in addition to their own capital, they are closely bound up with leading financial institutions, not only in Germany but elsewhere on the Continent, in a manner which does not exist in Great Britain.

In contrast with this policy of association, which has proved so successful both in Germany and in America, Great Britain has always discouraged combination, fearing a rise of prices to the detriment of the consumer. As a result of this policy of isolated effort, numbers of small concerns have arisen, each struggling against the other for bare existence. By association it would be possible to manufacture each class of apparatus in the most suitable factory, the management of which would thus be concentrated on its own specialty instead of being wasted on a variety of products. It is essential that output should be thus consolidated instead of remaining in the hands of a number of weak concerns, many of which, moreover, have further reduced their competitive power by dabbling in a variety of productions. The Committee is convinced that under properly organised combination or association the cost of production will be materially reduced, and that there is no reason to fear that enhanced prices will be charged to the consumer as a result of such combination. If electrical factories, which are unquestionably necessary on national considerations, are to be maintained in a state of efficiency, steps must be taken at the earliest possible moment to deal with the problem. A sound and permanent industry can be established not only to supply the home market, but to secure a much greater proportion of the overseas trade of the world. This can be done either by amalgamation among the companies engaged in the industry or by the development of the practice of association for common purposes. In whichever direction action be taken, the Committee is convinced of the need for reform. Only by the creation of strong combinations will it be possible for Great Britain to compete with the great foreign corporations, which not only manufacture, but undertake comprehensive contracts, make powerful financial alliances, and thus exert in every direction greater influence than is possible in the case of any individual firm.

An important advantage resulting from such combination would be the extension of standardisation, which the Committee considers is of the highest importance from a national as well as from an international point of view. It is to be hoped that the Government will do its utmost in future to accept recognised standard plant, as its example in the past, in calling for modifications, has had a pernicious influence on other buyers. During the war makers' standards have perforce been accepted, and have been found to satisfy all practical requirements. While it is hoped that in the case of heavy plant, British standards may be acceptable abroad, makers must be prepared to adjust themselves to the needs of the country concerned, where accessories of a different type have become universal. It cannot be expected that our export trade will compete successfully in the future unless the language, prices, and measures current in each country are employed in the catalogues and descriptive matter issued.

The necessity for protective duties has been emphasised by many witnesses connected with manufacturing interests, and has been frankly recognised by representatives of purchasers. The Committee is convinced that adequate protection is necessary, and should be given at least for a period.

(To be continued.)

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

Water-Testing Apparatus.

The presence of salt in boilers is highly objectionable. In the ordinary course, the water in boilers is tested regularly by the salinometer; these tests are satisfactory so far as they go, but give no indication of the rate at which salt is entering the boiler.

The Simplex Patent Salt Detector, made by Bromell Patents Co., Ltd., 12, Bath Street, Liverpool, is designed to give a continuous indication of any salt in the feed water, and thus show the presence of salt there before it enters the boiler; also in the event of a sudden increase of salt it gives warning immediately. The apparatus is very simple, its working being based on the fact that pure water has a high electrical resistance, which falls if certain compounds are added to the water. The essential part of the apparatus is a glass vessel fitted with two electrodes, by which a current is passed through a sample of the feed water. The necessary current is taken from any convenient power or lighting circuit, either direct or alternating current. The electrodes are made of a special grade of carbon, and are so arranged that no metal part of the connections is in contact with the water. The electrodes are adjustable, so that the sensitiveness of the instrument can be varied.

In the Simplex apparatus a resistance is introduced which is preferably in the form of an incandescent lamp. By varying this resistance (by using lamps of different candle power), the sensitiveness can be varied as desired. A high-candle-power lamp gives greater sensitiveness, and a low candle-power less sensitiveness. The voltage of the lamp should be slightly lower than the line voltage. The lamp shows no light when the water is fresh, but as soon as salt is present will begin to glow a dull red, which gradually increases to full brightness as the salt increases. The brightness of the lamp enables it to be seen at a glance whether there is salt in the feed, and whether it is in sufficient quantity to require immediate attention. The voltmeter gives a quantitative indication of the amount of salt present, and may be calibrated, if desired. This cannot be done with any great accuracy, in the majority of cases, as the readings vary considerably with the temperature of the feed water. If desirable a definite warning may be given by a bell or buzzer, which is arranged to operate by a relay connected in series with the instrument.

As will be seen from the illustration, the whole apparatus is self-contained in a polished teak case, with a plate-glass door. The buzzer is fitted to the outside of the case, while the connection to the electric circuit is made by a plug, so that a connection can be

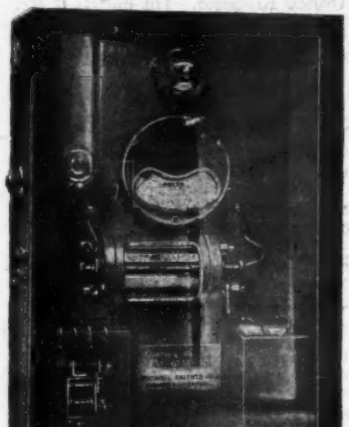

Fig. 1.—The Simplex Patent Salt Detector.

taken from any lampholder. The various indicators—voltmeter, lamp, and buzzer—can equally well be fitted in any other position, and at any distance from the instrument.

Should a log be required showing the condition of the feed throughout a watch, a recording voltmeter with a roll or circular chart operated by clockwork in the usual way may be fitted. The sensitiveness of the instrument is very great, and compares well with that of the nitrate of silver test. One grain of salt per gallon can readily be shown. It is thus very suitable for use in connection with the distilling of fresh water for drinking purposes. While the apparatus was intended, in the first instance, for use in marine work, there are many other applications in connection with chemical works, &c., which will readily occur to those familiar with them.

The Wild-Barfield Electric Muffle.

The Wild-Barfield muffle comprises an inner cylinder of highly-refractory material and an outer cylinder from which it is insulated by special lagging. The inner pot is wound with a heating and magnetising coil, the ends of which are connected to terminals on the exterior of the outer cylinder. The latter is wound with a

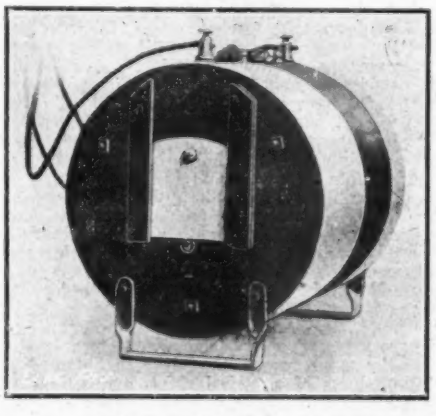

Fig. 2.—The Wild-Barfield Electric Muffle.

coil of special wire, which forms the pyroscopic detector and antomatically gives the change point of carbon steel, similarly connected with terminals to the galvanometer circuit through a special device known as a compensator, which has been designed for balancing inequalities of voltage in the heating and magnetising circuit in order to give a clear and steady reading on the galvanometer scale. It consists of a hard-wood frame wound with

primary and secondary coils of insulated copper wire connected to terminals for the electric supply and galvanometer circuit respectively.

A regulating switch is supplied to keep the current within the necessary limits of heating required. The current consumption is comparatively small; a muffle having an internal chamber dimension of 12 in. × 4 in. takes 1,400 watts to reach a temperature of about 1,000° C. On account of the excellent heat-resisting qualities of the lagging used, the heat losses are small.

It will be readily seen that the advantages of this furnace are numerous. In addition to laboratory work, it is used for hardening drills, annealing, &c., and, as the furnace is portable, it can be used in situations where the use of other types would be impossible. It should be noted that the adoption of the pyroscopic detector, in conjunction with any type of furnace, ensures the finest possible grain, and prevents the steel becoming overheated.

The apparatus is made by Automatic & Electric Furnaces Ltd., 6, Old Queen Street, S.W. 1.

LEGAL.

Hume *v.* Ferranti, Ltd.

In the King's Bench Division, on June 18th, a Divisional Court, composed of Mr. Justice Shearman and Mr. Justice Sankey, heard an appeal from the judgment of Judge Hogg, in the Oldham County Court, in this case.

Mr. Rigby Swift, K.C., appearing for the defendants, who were the appellants, said that the judgment from which he was appealing was given on December 20th, 1917, and was in effect that the plaintiff was entitled to £2 14s. for breach of an implied undertaking by the defendants to find plaintiff a reasonable amount of work. The amount in dispute (said counsel) was a small one, but the case governed a great many others, and it was regarded as a test case. It was really a point of substance as to procedure raised under the Munitions of War Act, 1915, and the Acts amending it. The learned County Court Judge thought so, and gave costs on the High Courts scale. Plaintiff was an iron moulder in their engineering works at Hollinwood, near Manchester. He was a piece-worker, and his average earnings amounted to £2 14s. a week. It was said that the custom was that where there was no work there should be no pay, but the whole question was whether the Munitions of War Acts had imported a term as to notice into the agreement, and whether the term having been so imported the plaintiff could sue for a breach of the term in the County Court. On May 3rd a section of the men, about 117, of whom the plaintiff was not one, went out on strike. In consequence of that action on the part of the men, the employers, rightly or wrongly, stopped the whole of the work. The County Court Judge found that the defendants were wrong in not providing plaintiff with work. The man was not dismissed; he remained in the defendants' employment ready for work. His contention was that the Judge wrongly construed the Acts of Parliament, and that plaintiff was not entitled to judgment.

Mr. Cyril Atkinson, K.C., for the respondent, contended that the real question brought before the judge was whether the terms of employment were varied by the Acts of Parliament; but it was not admitted by the plaintiff that when there was no work there should be no pay. The only thing admitted was that if before the passing of the Munitions Act there was no work there should be no pay, but after the passing of the Act he was entitled to a week's notice. *Prima facie*, an employer was bound to find work for his servant, but an employer might get away from that duty by proving custom in the trade that if there was no work there should be no pay. Under the Act a man could not leave his employment without notice, and on the other hand, it was provided that notice of dismissal should be given by the employer.

Mr. Justice Shearman, in giving judgment, said that the County Court Judge had held that the Act of Parliament had imported the term as to notice into the contract, but even if it was so imported, the Act appointed a special tribunal to deal with the matter. In his opinion the County Court Judge was wrong in holding that it was so imported by the Act and the plaintiff was right in his contention that the only tribunal by whom the matter could be decided was the Munitions Tribunal. The plaintiff had brought his action in the wrong Court, and on that ground the appeal must be allowed, with costs.

Mr. Justice Sankey concurred.

Mr. Cyril Atkinson asked for leave to appeal, as many other workmen were affected by the judgment.

Mr. Justice Shearman said that he (Mr. Atkinson) would have to go to the Court of Appeal for leave to appeal.

Harris *v.* Hinds.

In the King's Bench Division, on June 19th, Mr. Justice Coleridge had before him an action in which Mr. Thos. Harris, now trading as Albert Lee & Co., and Albert Lee & Co., Ltd., of 2 and 3, New Zealand Avenue, E.C., claimed from J. H. Hinds & Co., of 6, Eldon Street, London, the sum of £158 paid to defendants for electric batteries which were alleged to be defective and useless, and damages for alleged breach of contract.

Defendants paid £20 into Court in respect of a number of batteries in question, and, in respect of the remainder, denied that they were defective and useless, as alleged.

Mr. J. B. Matthews, K.C., and Mr. Thorpe appeared for the plaintiffs, and Mr. Langdon, K.C., with Mr. Wallington for the defendants.

Mr. Matthews, in opening, explained that the reason there were two plaintiffs was that Mr. Harris converted his business into a company, which was incorporated in May, 1916, and it was doubtful whether some of the damages accrued to Mr. Harris before his assignment of the assets to the company. Before the formation of the company Mr. Harris carried on business at 28 and 29, London Wall. The defendants were in normal times, said counsel, clock and watch manufacturers, but they also had dealings in electric batteries and refills. The plaintiffs bought from the defendants a large number of these batteries upon a warranty that they had a certain period of life—that was life after they had been on the shelf. Four months was the period during which they were supposed to retain their full lighting power. Plaintiffs' case was that the warranty ran from the time at which the goods were delivered to them. Plaintiffs were middlemen selling to retailers, and the defendants were not themselves the manufacturers of the articles, but they sold direct in their name and were personally liable on the contract. They got the goods from the Inter-State Electric Novelty Co. of the United States. Plaintiffs' order was given on February 15th for 20,000 No. 920 electric torches. On March 1st, Mr. Pott, acting for the defendants, called upon the plaintiffs, and said there had just arrived in England 9,000 of a kind exactly similar to the 20,000 ordered, and asked if they would take immediate delivery of that consignment. This was agreed to, the price being 5s. 3d. a dozen plus the shipping charges. The 9,000 duly came to hand, but as they were in advance of what the plaintiffs required for their business, the cases were not at once broken open. When plaintiffs did break open the cases, they found that some of the batteries were sweating, which was the first symptom of decay. When they came to test them, they found that they were defective and wholly useless for the purpose. The three-cell batteries, which should have shown a voltage of 4·5, were below 4, and the two-cell batteries, which should have shown a voltage of 3, were below 2·5, while a large number showed no voltage at all. Plaintiffs were unable to state the precise number which showed no voltage, but there were many. They had paid in respect of the goods £176 7s. 5d., and for shipping charges £17 12s. 9d., and for cartage and labour £2 10s.—amounting in all to £196 10s. 2d. They telephoned to the defendants, and told them that the goods were of no use and that they must take them back. They were doing a tremendous business in these things at the time, and they could get no satisfaction.

In reply to the Judge, Mr. Matthews said that the goods were not actually sent back, as plaintiffs were anxious to keep on good terms, and the matter was not one of urgency. Defendants said they would communicate with their people across the water, but he (counsel) contended they had rejected the goods legally. He pointed out that the defendants had admitted liability regarding some of the batteries by paying £20 4s. into Court, and he asked his Lordship to judge of the character of the whole of the goods "by the company they had kept." As to the claim of the plaintiffs for damages, he said there was a "roaring" sale for these goods, and plaintiffs had lost the profit they would have made on the sale to retailers. In respect of that they claimed £65, which worked out at 33⅓.

Before counsel had concluded his opening statement, it was announced that the case had come to an unexpected termination, as the parties had arrived at a settlement. He handed a note to the Judge, and stated that the parties would resume business together.

The action thus terminated, the terms of settlement not being announced.

WAR ITEMS.

Exports to Switzerland: Prohibition.—The "London Gazette" for June 25th contains a lengthy proclamation relating to the prohibition of exportation of certain articles from the United Kingdom to Switzerland.

Uruguay.—The "Review of the River Plate" contains the following paragraph:—"The Government has instructed the National Office for the Inspection of Banks to intervene in all operations carried out by the 'Transatlántica' Tramway Co., with the object of preventing that company carrying on any commercial transactions with firms whose names appear in the 'Statutory List.'"

League of German Electricity Supply Undertakings.—The *Vossische Zeitung* of May 23rd, in reporting briefly the third annual meeting of the League of Electricity Supply Undertakings of Germany, states that the League now includes all companies of any importance in the domain of electricity supply and finance. In the affiliated concerns about 2¾ milliards of capital are invested.—*Board of Trade Journal.*

Bolting the Door Against Bosch.—With reference to our paragraph under this heading last week, we understand that news has been received that the Australian Government has prohibited the importation into Australia of American-made Bosch magnetos. The High Commissioner of the Commonwealth, in a letter announcing this fact, says that "this action has been taken in order that the Commonwealth may not be a party to maintaining German trade names for the ultimate benefit of German manufacturers after the war."

Strike at Mülheim.—The "Times" correspondent at the Hague says that an extensive strike broke out on Thursday last week at Mülheim, near Cologne, at "a former cable factory which is now a munitions works." About 20,000 workers struck. Trouble had been brewing for some time, but the reduction of the rations was the last straw.

Tramway and Electricity Managers and Military Service.—By an arrangement between the Local Government Board and Sir Auckland Geddes, the managers, of the new military age, of municipal electricity works and tramways are not at present to be called up for medical examination, but this arrangement is subject to reconsideration at the end of three months.

Machine Tools and Woodworking Machines.—A circular letter has been addressed by the Ministry of Munitions to all controlled establishments pointing out that it is an offence under Regulation 30A of the Defence of the Realm Regulations for any person to buy or sell a machine tool or woodworking machine without the permission of the Ministry, even although such tool or machine may be described as "scrap," and stating that in view of the fact that it has been brought to the notice of the Ministry that in certain cases machines have been bought and sold as "scrap" in contravention of the regulations, those regulations in future will be rigidly enforced.

The Machine Tool Department, Charing Cross Buildings, Embankment, must be notified of any machine tools or woodworking machines alleged to be "scrap" which a firm may have for disposal, so that inspection can be made on behalf of the Ministry. The firm will be informed as soon as possible after an inspection has been made whether the machine tools in question have been classified as "scrap" or as "serviceable" machines.

If the machine is classified as "scrap" the fact will be notified by the Ferrous Scrap Department, Whitehall Place, S.W.1, and such "scrap" machine may only be disposed of in accordance with the instructions received from that Department.

If the machine is classified as a "serviceable" machine the fact will be notified by the Department of Engineering (Central Clearing House Section), and the machine will in that event be placed on the list of second-hand machines available for transfer kept by the Ministry, and notification of its ultimate disposal will be sent by the Machine Tool Department of the Ministry.

German Stocks in Neutral Countries.—A member of the House of Commons last week asked the President of the Board of Trade whether he had any official information showing that Germany was having goods manufactured in neutral countries with a view to exporting them to the United Kingdom as neutral goods at the conclusion of the war, and that large quantities of raw materials were actually held in England to-day occupying store space and ready to be shipped to neutral countries for manufacture directly there was a chance of export; and, if so, whether any of these goods were German owned and were transferred to neutral nominees at the commencement of the war. In reply, Sir Albert Stanley said that he had no official information to the effect stated, but he would be glad to consider any evidence as to the storage of goods on foreign account in this country. The Imports and Exports (Temporary Control) Bill, when it became law, would provide the necessary machinery for carrying out, after the war, any policy regarding the control of imports and exports which might be decided upon.

Exemption Applications.—At the Wakefield Local Tribunal, the Wakefield Tramway Co. appealed for the exemption of one of their drivers (44), Grade 1, a man with eight children. The company contended that the man was doing work of national importance. He was such a safe driver that he was entrusted with the teaching of discharged soldiers and new men. He was no "slacker," as during the past six months he had averaged 68 hours a week on tramway work, and, in addition, in his spare time he put in 25 hours a week for a market gardener, as well as cultivating two allotments of his own. Six months' exemption was given, together with exemption from drill.

At Warrington, the Infirmary Board of Management appealed for an employé (30, Class A) who is in charge of the electric light installation, fruitless efforts having been made to secure a substitute. The appeal was refused, with two months' grace.

The Halifax Tribunal has withdrawn exemption held by G. Thomas (41, Grade 1), a machinist engaged on the Halifax tramways. W. R. Shepherd (43, Class A), in charge of the coal-conveying plant at the Corporation electricity works, has been given final exemption until August 15th.

The West Ward (Cumberland) Tribunal has refused exemption to T. Martin (Grade 1), electrician, applied for by Miss Noble, C.C., Beckfoot, Bampton.

At Windermere, the Electricity Supply Co. appealed for J. Reid (32, Grade 2), the only competent engineer left on the staff, and temporary exemption until September 30th was given.

At Hastings, appeals for J. Willard and G. Brett, employés of the Tramway Co., were adjourned until they are called up, they being in an exempted occupation.

At Bath, appeals filed by the National Service Representative against W. G. C. Adams (31, Grade 1), chief clerk and cashier, and W. J. Targett (34, Grade 1), engineering fitter, with the Bath Tramways, Ltd., were withdrawn, both having received exemption certificates from the Ministry of Munitions.

The West Kent Appeal Court has granted three months for substitution to E. Croucher (33), C. F. Hayter (30), S. W. A. Mercer (29), F. Ralph (26), and S. A. Sharpe (31), all in Grade 1, motormen with the Chatham & District Tramway Co.

Before the West Kent Appeal Court, exemption was claimed by J. E. Freathy (43, Grade 2), chairman of the Gillingham Corporation Electric Light Committee, and formerly the National Service Representative for the borough. The Town Clerk said that as chairman of the Electric Light Committee Mr. Freathy was enabled, owing to the technical knowledge he possessed, to render considerable assistance at the works in the evening; he was, in fact, doing the work of a skilled man. On the Court dismissing the appeal as from July 31st, the Clerk pointed out that that would put Mr. Freathy in a worse position, as the local tribunal gave him two months. The Chairman: Then we will dismiss the appeal, and the order of the local tribunal stands.

At Salisbury, exemption was sought for an electrical installation attendant at an estate at Alderbury, aged 44, and in Grade 1. It was stated that the man had charge of two large 40-H.P. suction gas plant engines, which supplied the whole motive power for the estate machinery, and he had had care of the electric plant since it was installed 11 years ago. On the appeal being opposed by the National Service Representative, the chairman said that skilled electrical engineers were extremely difficult to find at the present time, and the Isolation Hospital Committee had found it impossible to get one. The Tribunal considered that the man was absolutely essential in his present position, and gave exemption until September 1st. Notice of appeal was intimated.

Exemption until September 30th has been granted to C. H. Lewis (44, Grade 1), secretary to the Leominster Electric Light Co., Ltd.

On the application of the National Service Representative, a protection certificate held by S. Knowles (37, Grade 1), secretary to the Bishop Stortford and Epping Gas & Electricity Co., has been withdrawn.

BUSINESS NOTES.

Competition in Electrical Trade in China.—The issue of the *Japan Advertiser* for April 5th states that "with the arrival of a party of Chinese business men and newspaper men in Tokio to-day, in compliance with the invitation from the Electrical Exhibition at Uyeno Park, the real motive of the men planning this show has been revealed; and it is clearly known that Japanese electrical engineers have an ambitious scheme of replacing the German electricians in the market in China and, after the war, trying to contest that big commercial theatre with American and British engineers." The Chinese party was to visit various electrical engineering works, and also the electrical laboratories of the Department of Communications, of the Imperial University, and some technical schools, where scientific and industrial research is being carried on. Japan has supplied China with electric lamps, wires and cables through establishments at Shanghai. The latest of them, the China Industrial Development Co., has also the supply of these goods in sight. In a recent report, H.M. Commercial Attaché at Yokohama stated that the manufacture of electrical machinery and appliances in Japan had undergone great development since the first electrical industry was established some 30 years ago. The object of the Tokio Exhibition referred to above was to demonstrate the progress that had been made. The exhibits appear to have covered a fairly wide range of goods; they were divided into six sections—domestic appliances, electrochemical industry, electric transmission apparatus (two sections), and electrical engineering, machinery, &c. (two sections).—*Board of Trade Journal.*

Manufacture of Electric Lamps in India?—*Indian Engineering* of June 18th, in referring to the enormous increase in the manufacture of electric lamps in Japan, says:—

"Compare this enterprise with India; why is it that India has not started her own manufacture of such an essential, and at the same time practically standardised, article? The present extra cost resulting from freight, breakages, and special packing for export would go considerably towards paying the interest on any capital expenditure incurred in starting a manufactory in the country."

French Commercial Bureau in London.—An "Office Commercial Français en Angleterre," under the auspices of the French Chamber of Commerce in London and subject to the control of the French Ministries of Commerce and Foreign Affairs, represented by the Commercial Attaché to the French Embassy in London, has been formed, having for its object the establishment and development by all means of commercial relations between French producers and British buyers, and the promotion of the sale of French goods in the United Kingdom.

According to the *Board of Trade Journal*, among the methods to be employed will be the holding at least four times a year of a Samples Exhibition of French products. These will last for about a fortnight, and will be opened, by invitation, to French, British, and Allied firms likely to be interested, and during the last days of each exhibition, to the general public. The first of these exhibitions will not be held before the beginning of October next.

Further particulars may be obtained from the Office Commercial Français en Angleterre, 153, Queen Victoria Street, E.C. 4.

Patent Restorations.—Orders have been issued restoring the following patents:—James Todd, "Improved fastenings for smoke-box doors of tubular boilers, or the like," No. 15,593, of 1909; H. T. Williams and L. Wirtz, "Improvements in change-speed and in change-speed and reverse gears," No. 22,172, of 1912.

Sale of Electrical Cables in Australia.—The Department of Trade and Customs has decided to regard the use of the letters "C.M.A." on the labels attached to imported wires and cables as an indication that the manufacturers of the goods are associated with the British Cable-Makers' Association, and that the goods have been manufactured in accordance with the specifications of the Association. The use of the word "Association" when unqualified is also to be regarded as having similar implications. The Department has also decided that statements such as the following:—

> "Guaranteed equal in all respects to 'C.M.A.' product of similar grade,"

may be used on wires and cables manufactured by non-members of the British Cable-Makers' Association, provided the goods are thereby correctly described.

In reply to a suggestion that, in addition to the foregoing, the maker's name and country of origin should also be distinctly stated on the label, the Department point out that there is no power under the "Commerce (Trade Descriptions) Act, 1905," to require the name of the manufacturer to be marked on imported wires and cables. A statement of the country of origin is, of course, required to be marked in conjunction with any English wording applied to any goods made in a country where English is not the ordinary language used, and which are imported into the Commonwealth.

H.M. Trade Commissioner will report in due course whether any testing arrangements are being devised by the Department of Customs and Trade, to ensure that goods imported by non-members of the Cable-Makers' Association are correctly described.—*Board of Trade Journal.*

Book Notices.—"*The Electrician* Annual Tables of Electricity Undertakings of the United Kingdom, the Colonies, and Foreign Countries." London: Benn Bros., Ltd. 1918. Price 5s. net.—Hitherto these tables have been issued from time to time in *The Electrician* in the early months of the year. They are now being published separately in one cover annually on May 1st. The present issue contains the accounts and particulars of British electricity supply undertakings; electricity supply schemes projected; prov. orders undeveloped; British electrical power companies; Colonial, Russian, and foreign electricity supply works; Colonial and foreign electric railways and tramways; and electricity supply works in the Argentine.

"Bulletin of the Bureau of Standards." Vol. 14, No. 1, contains the following:—Determination of Degree of Uniformity of Bars for Magnetic Standards; Thermo-electric Measurement of Critical Ranges of Pure Iron; a Study of Electromagnet Moving-Coil Galvanometers for Use in Alternating-Current Measurements; Standard Substances for the Calibration of Viscometers; an "Average Eye" for Heterochromatic Photometry, and a Comparison of a Flicker and an Equality-of-Brightness Photometer; Emissivity of Straight and Helical Filaments of Tungsten, &c. Washington: Government Printing Office. Price 25c.

Japanese Electrical Machinery and Fittings in India.—Special efforts are at present being made to introduce electrical machinery and fittings of Japanese manufacture into India. One concern, the Mitsui Bussan Kaisha, Ltd., of Tokio, has now established an office in Calcutta for the purpose.

Liquidations.—A.E.G. Electric Co., Ltd.—A petition by the Board of Trade for the winding up of this company is to be heard on July 2nd.

Technical Engineering Co., Ltd.—Meeting called for July 23rd at 2, Bixteth Street, Liverpool, to hear an account of the winding up.

J. T. Pickering Hoist and Engineering Co., Ltd.—Meeting July 27th, at Nottingham, to hear an account of the winding up from the Liquidator, Mr. S. B. Saunders.

Bankruptcy Proceedings.—William T. Smith, electrical and mechanical engineer, Bolton.—The adjourned examination of this debtor took place at Bolton on June 19th, when the Official Receiver stated that the creditors' meeting stood adjourned to enable the debtor to formulate a proposition which he hoped would be to the advantage of the creditors. He was developing certain inventions which it was not necessary to particularise. The Receiver asked for an adjournment of the examination until after the creditors' meeting. Adjourned.

Trade Announcements.—Messrs. Thermit, Ltd., 675, Commercial Road, London, E., inform us that the whole of the company's shares, which in August, 1916, were sold by the Public Trustee to the Birmingham Metal and Munitions Co., Ltd., have now been taken into their own holding by Nobel's Explosives Co., Ltd., Glasgow, and under the new auspices the activities of Thermit, Ltd., are being considerably extended.

Owing to war conditions, Messrs. Graham & Latham are closing down their showrooms and offices at 104, Victoria Street, S.W., and transferring the head office to the works at Cremorne Wharf, 27, Lots Road, Chelsea, S.W. 10. As from 30th inst., communications should be sent to the latter address. Telephone No.: "Kensington 3761."

Lists.—The Hillbar Press, 76, Finsbury Pavement, London, E.C. 2.—Priced circulars illustrating their soldering irons, dolly-making machines, and other appliances for the dry battery trade.

Unfenced Machinery.—According the *Times*, the Pirelli-General Cable Works, Ltd., were fined £25 at Southampton, on Tuesday, for having some unfenced machinery through which a female employé met with an accident and lost an arm.

Moonlight Charts.—Messrs. C. A. Vandervell & Co., Ltd., have issued their moonlight charts for July.

LIGHTING AND POWER NOTES.

Australia.—Tasmania.—A curious situation has arisen at Hobart. In December, 1915, the manager of the State electricity supply undertaking, Mr. J. H. Butters, issued a circular urging consumers to make every possible use of electrical energy, which was derived from water power, so that the revenue would be increased and a deficit avoided; the promise was also made that the price would be reduced as the consumption increased. Now, however, the price has been increased, because the demand is so great that the steam plant has had to be brought into use! The war is blamed for the shortage of pipes, resulting in insufficient capacity of the hydro-electric plant.—*Hobart Mercury.*

Barnes.—Bulk Supply.—The Lighting Committee reported that it had considered the question whether it would be more advantageous to obtain a supply of electricity from the London and South-Western Railway than to provide for an additional supply by extending the works and installing new plant, and recommended that the scheme for obtaining the supply on suitable terms from the railway company be proceeded with, and that the engineer should continue negotiations with the Director of Electrical Power Supplies.

Bexhill.—Year's Work.—The gross profit on the Corporation's undertaking during the past year was £5,602. After payment of loan charges, &c., there is a net profit of £197. Working expenses have increased on account of the cost of materials and some adjustment to wages, but the increase of revenue due to the expansion of the business has been sufficient to meet the extra cost. The working cost per unit has again dropped by '09d. The result of the year ending March, 1917, was a deficit of £284.

The 12½ per cent. Award.—The Council has agreed to accept the award of 12½ per cent. for electrical workers as applied to the employés of the electric light undertaking.

Bury.—Price Increase.—The Corporation Electricity Committee is increasing the charges for electricity for lighting, power, and heating, as from July 1st, by adding a further 10 per cent. to each account.

Continental.—France.—A special Commission appointed last year to compare and report upon the various projects for the use of the hydraulic energy of the Rhone has recently decided to recommend the abandonment of the proposed construction of a dam near Pont de Grésin, about 12 miles from the Franco-Swiss frontier, and of another near Malpurtuis, in favour of a scheme which provides for the erection of a hydraulic power station at Génissiat, about 4½ miles south of Bellegarde. By the dam at Génissiat, with a height of about 250 ft. and a fall ranging from 201 ft. to 226·3 ft., a total of 240,000 H.P. is provided for. By means of the proposed works a reservoir would be formed by the river, when in high flood. This reservoir would be about 14½ miles in length, reaching almost to the Franco-Swiss frontier, with a superficial area of some 940 acres, and a summit level of 1,089 ft. above the sea.

With a view to developing certain waterfalls which it has in reserve, the Société Générale de Force et de Lumière, of Grenoble, has decided to increase its capital from 18,000,000 francs to 30,000,000 francs.

Under the style of L'Energie Electrique Rhône et Jura, a company has been formed to utilise a fall on the River Ain and build a hydro-electric station at Bolozon, Arrondissement of Nantua.

The Compagnie Electrique de la Loire et du Centre is taking steps to utilise the falls at Besbre, estimated to supply some 30,000,000 KW.-hours a year. The energy will be transmitted to Roanne and supplied to the arsenal there through the Chatel Montagne and Yourdiat stations.

Works for the manufacture of a new iron alloy are in course of construction by the Société Electro-Chemique du Giffre (Upper Savoy), a new company formed for this purpose.

In connection with the development of Bassens, on the Gironde, about 1 kilometre above Bordeaux, as a seaport, it has been decided to erect a steam-driven electric power station to work the goods-handling plant, part of which latter has already been ordered in the United Kingdom. The scheme is intended to relieve the congestion of traffic which exists at Bordeaux.

Italy.—The Higher Council of Waters has declared itself in favour of admitting for examination a scheme for certain hydro-

electric developments in Sicily. The scheme includes the formation of two artificial lakes, one on the Flascie torrent, and the other on the Alcantara torrent, at about 1,135 metres above sea level. A total of 30,000,000 cb. metres of water would be stored and utilised by means of these artificial lakes. This electric plant would stimulate the industrialisation of the districts between Catania and Messina, and would render the electrification of the Catania-Palermo railway possible. Above all, the water which was formerly wasted during the floods would be available during the dry season for irrigation. This is the first instance of artificial lakes on a large scale carried out in Sicily.—*Board of Trade Journal.*

RUSSIA.—According to the *Zeit* of April 20th, the National Economic Council has undertaken the erection of electric power stations in order to utilise the water-powers of various rivers. The power obtained is expected to provide all the Petrograd industries with electricity. A special station for Petrograd alone is to be erected on the Velkhov. The line voltage has been fixed at 60,000 volts.

SPAIN.—It is announced that a company has been formed to exploit the falls of the Douro River, which are 300 ft. high, and are estimated to be capable of developing 350,000 H.P. The capital of the company is entirely Spanish, and amounts to £6,000,000. The power developed will be conducted to Madrid, Bilbao, and throughout Galicia; the enterprise is expected to hasten the electrification of the railways throughout the north and east of Spain.

A draft scheme has been laid before the Cortes to authorise the Government to arrange with the Compania de los Ferrocarriles del Norte for the immediate installation of electric traction on the slope of the Pagares and on the Leon to Gijon line, and for the necessary widening works on the same line and on that of the Venta de Banos to Leon railway, to meet the increased coal traffic on the Pampas section, estimated, a year from the completion of the works, at 1,500,000 tons per year. The scheme will be subsidised by the Government.—*Industria e Invenciones.*

SWEDEN.—What are claimed to be the world's largest generators for water power are being built in Sweden by the Almänna Svenska Elektriska Aktiebolaget in the works at Västeras. The generators, of which two have been ordered by the "Glomfjord," Ltd., in Norway, will have an output of 22,000 K.V.A. at 300 R.P.M., and 15,000 volts. The stators are built in four pieces, and have a weight of 100 tons each, not including the windings.

AUSTRIA.—The Austrian Government has drafted a plan for the development of the hydro-electric resources of the country, the eventual object being the electrification of the principal railway networks. According to estimates the hydraulic resources of the Austrian Alps total 3,000,000 H.P., of which only 3 per cent. is now utilised.

Dundalk.—YEAR'S WORKING.—The annual statement of accounts for the year ended March 31st, 1918, shows £9,345 total revenue; total expenditure, £5,353; gross profit, £3,992; interest, £1,331; sinking fund, £2,290; net profit, £370; as compared with a deficit of £1,177 the previous year. During the year 790,962 units of electricity were sold; total average works costs per unit sold, 1·621d.; total all-in costs, 2·720d.; average price obtained per unit sold, 3·529d.; total maximum demand, 506 KW.; load factor, 17·9 per cent. Mr. Spalding, the electrical engineer, reports that since July 17th tar oil has been used exclusively as the main fuel on all the Diesel engines. The adaptation of the five engines to burn tar oil involved a capital outlay of £950; towards which the Great Northern Railway Co. of Ireland, Ltd., contributed £400 in respect of two new engines. The cost of tar oil is 83s. per ton, as against 180s. per ton for crude oil, the rate of consumption being about 350 tons.

Dundee.—YEAR'S WORKING AND PRICE INCREASE.—At the last meeting of the T.C., in submitting the accounts and estimates, it was stated that the income last year was £103,213, and the balance, after paying all outgoings, was £295. There was an increase of revenue of £27,000, due to increased charges and also to an increase of 15 per cent. in the number of units sold. It was estimated that generation costs this year would be increased by £8,000, while there would also be a reduction in the number of units sold as a result of the Daylight Saving Act and other causes. Mr. Hynd, the convener of the Electricity Committee, said that the new charges for electricity for lighting would work out at an increase of from ¼d. to ½d. per unit, according to the class, the highest class being 5d. per unit; while for power the charge for the first 10,000 units would be 2¼d. per unit, instead of 1¾d. The charges for subsequent quantities would remain as at present, and there would be no change in the charges for the tramways. The lighting charges were now from 43 to 46 per cent. higher than the pre-war rates. For power the increase on pre-war rates was for the first 50,000 units 50 per cent. and over that quantity 100 per cent. The proposals were agreed to.

Ebbw Vale.—UTILISATION OF WASTE GASES.—The chairman (Sir Chas. Allen) stated at the ordinary general meeting of the Ebbw Vale Steel, Iron, and Coal Co., Ltd., that the company now has, owing to large extensions to its blast furnace, coke oven, and by-product plant, large volumes of waste gases which are to be turned to profitable account. Sufficient electric power is thereby to be generated to enable the company to electrify the whole of its property, not only the iron and steel works, but also the collieries in Ebbw Vale and the adjoining valleys. Work is now in hand, and nearly completed, which will connect its newly-acquired coal properties with its central power station at Ebbw Vale, so that these mines, situated several miles distant, will derive their power from the waste gases available from the production of iron and coke.

Electricity Supply Charges.—The Board of Trade intends to introduce a Bill to give effect to the recommendations of the Select Committee on Gas Undertakings, and to include in the Bill provisions of a like nature in respect of electricity undertakings.

Great Harwood.—The U.D.C. has decided to apply for a renewal of the Electric Lighting Order.

Hornsey.—YEAR'S WORKING.—There is a loss of £2,006 on the working of the Council's electricity undertaking for the past 12 months.

Hull.—The acting engineer (Mr. McGoris), in referring to the shortage of plant, stated that the Electricity Committee was desirous of erecting steel steam and smoke stacks, but had been unable to obtain permission at present. It was agreed to give the employés double pay in lieu of the annual holiday, which could not be arranged this year owing to shortage of staff.

Ipswich.—LOAN APPLICATION.—The Electric Supply and Tramways Committee reported that the need for additional electrical generating plant at the power station had become urgent. The Committee had been in consultation with the Government Department concerned upon the matter, and now had an intimation from the Ministry that the proposals put forward were approved, and that the necessary permit and priority would be issued for the manufacture of what was covered by the estimate, totalling £43,000. The Committee considered that on the basis of the output for the past year the saving in coal by the new plant would be from £5,500 to £7,300, while the reduced consumption of water, oil, &c., and fewer repairs, should result in a further saving of from £500 to £600; the annual capital charges including amortisation would be about £4,300. The Committee, therefore, recommended that application be made to the L.G.B. for sanction to the borrowing of £43,000.

YEAR'S WORKING.—The report of the year's working shows a surplus of £2,174, of which an amount of £473 was expropriated to the liquidation of the adverse balance brought forward from the previous year, a sum of £118 went to cover certain capital expenditure (wages of permanent employés), which, under the rules of the L.G.B., must be defrayed out of revenue, and the remainder (£1,583) was transferred to reserve or renewals account. The sum of £1,134 has been received during the year from the General District Rate towards a sum to serve as working capital for the undertaking; the total sum now in hand amounts to £5,262.—*East Anglian Times.*

Leeds.—YEAR'S WORKING.—The annual report of the working of the electricity undertaking for the year ended March 31st shows total units sold 62,771,883, an increase of 7,779,141, or 17 per cent., 46,861,408 units being for power purposes, as compared with 40,143,880 in the previous year. The aggregate capacity of the motors connected has grown from 48,513 to 54,743 H.P., the consumption of electricity for lighting purposes indicates a recovery from the falling off induced by daylight saving and other measures, the units sold to private consumers having increased from 6,264,784 to 6,759,581, or 8 per cent. The number of consumers using electricity for heating purposes through separate meters has increased from 1,288 to 1,502, and the total capacity of the apparatus connected to such meters has increased by 30 per cent., the units registered totalling 1,169,082, as compared with 951,358, or 20 per cent.; the total number of consumers taking current on the rateable system of charging for private residences has increased by 26 per cent., and the units sold to such consumers by 37 per cent. The total cost of production per unit sold was 1·01d., as compared with ·98d. in 1917. The total all-in costs were 1·04d., and the average price obtained per unit sold was 1·04d. The maximum load was 24,920 KW., the present plant capacity being 41,800 KW. The 12,000-KW. turbo-alternator ordered in 1914 became available for use near the end of the period under review. The total revenue was £271,595; working expenses, £135,484; gross profit, £136,111; war allowance, £1,199; income-tax and interest, £47,237; sinking fund and special charges, £78,004; contributions to capital expenditure, £9,391; surplus profit £277, as compared with £4,161 surplus in 1917. During the year two engines and alternators, with a capacity of 1,400 KW. each, have been discarded and sold, and a contract entered into for a 6,000-KW. turbo-alternator, to be erected on the site of the discarded plant, representing a considerable saving of space and a prospective saving in coal consumption, the year's revenue being charged with £9,497 incidental to the discarding and replacement of the above plant. The reserve fund now amounts to £17,762.

Llandudno.—PRICE REVISION.—In January last the Urban Council decided to notify the Light Railway Co. of its intention to discontinue the supply of energy for traction purposes at the end of the year, as the price paid under the agreement has entailed a loss owing to the increased cost of fuel, &c. In reply, the secretary to the Railway Co. has inquired whether the Council has any suggestion to make before the company proceeded to arrange for an alternate supply. A sliding scale of charges has now been submitted based on the price of coal, and it is hoped this may form the basis of an agreement. The Council suggested to

the Railway Co. that the agreement for the supply of energy should be renewed, subject to the addition of the following sliding scale of charges, based on the cost of fuel :—That, in respect of all units consumed in any one year, no variation be made in the existing schedule of prices until after coal reaches 12s. a ton. When the purchase price of coal in any one year exceeds 12s. a ton and up to and including 13s. per ton, the price shall be increased by 0·05d. per unit ; thereafter, that the price shall be increased by an additional 0·05d. per ton for each complete additional 1s. per ton. During the past year the price of coal has been about 19s. a ton.

Annual Accounts.—The report of the year's working of the Council's electricity undertaking to March 31st last shows total income £11,463 and a total expenditure of £13,189, leaving a deficiency of £1,726 ; included in the expenditure was £50 for professional charges for the special report upon the undertaking prepared by Mr. Patchell. Last year the deficiency was £1,660, which was met out of the rates ; this year the Electricity Committee recommended that the deficit be met by a contribution of £1,000 from the rates and £726 from the reserve fund.

London.—Poplar.—Annual Report.—The total net profit on the working of the electricity department to March 31st last is £7,553 ; deducting £2,625 in respect of capital expenditure paid out of revenue, reduction of loans on account of services, and contributions to superannuations and pensions fund, leaves £4,928 available for distribution, which it is recommended shall be allocated as follows : At disposal of Finance Committee, £1,946 ; bonus to staff, £1,034 ; reduction of assets, £1,946.

The Electricity Committee recommends that the underfeed stokers of No. 11 boiler be fitted with a new type of chain-grate capable of burning breeze, coke, or anthracite coal, at an estimated cost of £3,000.

The Committee reports that a draft agreement has been settled with Stepney eliminating stand-by and bulk supplies which are not now necessary, and defining "light load" and "heavy load" periods, each party to reciprocate any supplies taken during any quarter. Cost of fuel has been the basis of the change, and it is proposed to include handling up to actual delivery into bunkers, testing for calorific value, and disposal of ashes. In the event of breakdown and the necessity to supply during heavy load, the receiving party to pay an additional 50 per cent.

Chelsea.—Cable Explosion.—The underground property of the Chelsea Electric Supply Co., Ltd., and the Borough Council, in Flood Street, was considerably damaged on Sunday night as the result of an explosion. A considerable length of cable was destroyed, two distributing boxes, six telephone junction boxes, and 30 ft. by 25 ft. of the pavement were damaged by fire and breakage. Rose Coward was injured, and had to be removed to hospital.

Nelson.—War Wages.—The T.C. has approved a recommendation that the war wage increase of 16s. per week paid to the employés in the electricity and tramway department be increased to £1 per week as from the first full pay-day after March 8th, subject to any exceptions for special reasons.

Pontypridd.—Price Increase.—The Electricity and Tramways Committee has decided to increase the charges for electrical energy for lighting, power, heating, and cooking purposes by 10 per cent.

Power Co.'s Bill.—The Yorkshire Electric Power Co.'s Bill, which has already passed the House of Lords, was read a third time in the House of Commons last week.

South Wales.—The Board of Trade has extended the Cowbridge and Pennybont Electric Light Order of 1914 of the South Wales Electrical Power Distribution Co. for one year.

Tonbridge.—The U.D.C. has purchased the Old Town Mill, fitted with a 20-H.P. water-wheel, with adjacent property, for £3,250. The electrical engineer (Mr. Plunkett) estimates the value of the wheel for producing energy at £300 a year.

Weymouth.—Price Increase.—The T.C. has decided to increase the charges for energy as under, as from September 30th :—From 6½d. to 7d., from 5½d. to 6½d., from 5½d. to 6d., from 2½d. to 3d., from 1½d. to 2d., military supply increased to 5d., fixed-price lighting increased by 20 per cent. The engineer states that, through the Lighting Restriction Order, the undertaking will lose approximately £1,000.

TRAMWAY AND RAILWAY NOTES.

Electric Vehicle Progress.—An electrically-propelled platform barrow for the carriage of parcels has been adopted by the North-Eastern Railway Co., and during the past few days has been on trial at the Newcastle Central Station. The barrow is similar in size to the ordinary four-wheeled luggage carrier now in general use, and is capable of carrying 25 cwt. So far the barrow has proved entirely satisfactory, and the idea is to be introduced immediately at other important stations.

The Brush Terminal in New York uses 12,000,000 KW.-hours per annum for charging electric trucks alone. This figure gives some indication of the possibilities of this large and practical field for the use of electrical energy.

The following record of a 750-lb. electric truck used in ordinary city deliveries for 30 working days is furnished by the Electric Vehicle Section of the National Electric Light Association, New York :—

Days operated	30
Miles travelled	1,140·5
KW.-hours used	319·5
Number of miles per KW.-hour	3·57
Average energy consumption for one day	10·65 KW.-h.
Average run	38·01 miles.
Average merchandise load (overload of 250 lb.)	1,000 lb.
Energy cost per car-mile at 3 c. per KW.-h.	$·008
" " " " at 4 c. per KW.-h.	·011
" " " " at 5 c. per KW.-h.	·014
Maintenance (maximum estimate), including repairs and renewals of all mechanical and electrical parts, including tires, battery, and painting of wagon, should not exceed	$·04 per c.-mile.

Bingley.—Price Revision.—The District Council has appointed a deputation to meet the Bradford Corporation Tramways Committee in regard to the recent increased fares and with a view to securing an increased payment by the Corporation for energy supplied by the Council in the Bingley area of the tramways run from Bradford. The Council has also adopted a recommendation that charges to local consumers of electricity be revised.

Birmingham.—Night Service.—The Tramways Committee is unable to accede to the request of the local Trades Council to extend the time (11 p.m.) of running the last cars from the city owing to the necessity for economy in the use of electricity, in order to conserve coal supplies.

Cardiff.—Fare Revision.—Mr. A. Ellis, the manager of the Corporation tramways, reported as to the necessity for an increase in the tramway fares, and suggested that the fare stages should be left as at present, but that the face value of each ticket be increased by ½d. The minimum fare would then be 1½d. Workmen's fares after the the first two miles to be increased by ½d. The Lighting and Tramways Committee decided to adopt Mr. Ellis's proposals, and the recommendations will be placed before the City Council in July.

Edinburgh.—Experts' Report.—The Tramway Committee reported that the accounts rendered by Mr. J. B. Hamilton, Leeds, and Mr. J. L. Brodie, Liverpool, the experts who had reported on the whole question of the tramway system of the city, amounted to £693 in the case of Mr. Hamilton, and £610 in the case of Mr. Brodie. Mr. Harrison, convener of the Tramway Committee, said the report, which was obtained on the instructions of the Council, was a very important one, which, he believed, when they came to remodel their tramways, would settle the kind of traction to be used.

Galway.—Tramways for Sale.—Tenders were recently invited for the assets of the Galway and Salthill Tramways Co. as a going concern. The liquidator is Mr. Michael Crawley. It has been reported that some of the members of the Town Council are in favour of purchasing the undertaking, with a view to the electrification and extension of the tramways as early as practicable.

Glasgow.—Year's Work.—The annual statement of income and expenditure for the T.C. tramway undertaking shows :—Traffic receipts £1,404,110, against £1,245,507 in the previous year ; the Sunday receipts were £8,524, compared with £14,607 ; the respective totals being £1,412,635 and £1,260,115. In all items of expenditure increases are recorded, the figures for the year till May 31st, 1918, and that till May 31st, 1917, being respectively :—Traffic expenses, £527,152 and £395,736 ; general expenses, £156,949 and £137,816 ; maintenance and repairs, £179,811 and £143,758 ; power expenses, £86,019 and £67,231 ; Clydebank bridges, £1,131 and £879 ; allowances to employés on war service, £93,120 and £92,646 ; totals, £1,044,183 and £838,066 ; balance carried to net revenue account, £368,452 and £422,049 ; totals, £1,412,635 and £1,260,115. The net revenue account, including interest on investments, amounted to £377,031 against £500,687 last year, approximated for 1918 and 1917 respectively as under :—Rent of Paisley lines, £11,119 and £8,453 ; interest on capital, none and £78,846 ; sinking fund, none and £114,378 ; income-tax, £64,405 and £64,623 ; Parliamentary expenses, £61 and £98 ; renewal and depreciation, £123,894 and £73,305 ; totals, £199,479 and £339,702. The sinking fund has been cleared off, and the department is now a free asset.

London.—L.U.T. Bill.—The London United Tramway Co.'s Bill has been passed by the Select Committee appointed by the House of Lords after the second reading, and will be reported to the House. The scheme outlined in the Bill includes a drastic reduction of the capital ; an increase of fares ; postponement of the date and an alteration of the terms of purchase by the local authorities. The part of the company's undertaking inside the

L.C.C. area and its power station at Chiswick have been acquired by the L.C.C. Accumulated surplus revenue is by the clause agreed to last week to be applied to putting the system into good condition and repair.

Cars on the London United Tramways system ceased running for some time on Saturday evening last owing to a temporary breakdown at the Chiswick power station.

L.C.C.—ANNUAL ESTIMATES.—The Highways Committee has reported that the revised estimated revenue and expenditure of the Council's tramways for 1918-19 are as follows:—Total receipts, £3,321,750; total working expenses, including war-service allowances and £50,000 for contingencies, £2,593,140; leaving an estimated surplus of £728,610, which with interest, &c., £23,279, totals £751,889; sinking fund and repayment charges amount to £695,205 and income-tax, to £44,569, leaving an estimated net surplus of £11,115 on the year's working instead of the original estimated deficiency of £205,290. The revised estimates are based on the assumption that the car-mileage during the year will be 50,000,000; the realisation of the estimates will depend on the maintenance of the necessary supply of power, on the necessary repairs to cars being effected, and a sufficient number of operatives being available. As regards the Government regulation requiring a reduction of 15 per cent. in the consumption of coal, the question of fuel economy has for a considerable time engaged the close attention of the Committee, and methods adopted for coal economy at the power stations by the partial substitution of coke locally produced have secured compliance with immediate Government requirements without reduction of the tramway services; as a further means of economising coal the Committee recommends the Council to approve a proposal for the grant of a bonus to motormen and conductors in respect of power which it will be possible to save if greater care is exercised in operating cars; the bonus to be 50 per cent. of the value of the direct saving on fuel due to decreased consumption of electrical energy.

The revised fares on the Council's tramways will come into operation on the lines in the east and north-east of London next Sunday and on the remaining northern services by July 17th.

APPROXIMATE RESULTS FOR 1917-18.—The results of the year's working of the Council's tramways to March 31st last are estimated to show a net surplus of £62,009; the amount, when definitely ascertained, will be available for transfer to the renewals fund.

Scarborough.—GOODS TRAFFIC.—The Electric Tramways Co. proposes to carry fish on the tramways from the piers to the goods station, and the Government is to be asked to grant assistance toward the cost of laying the additional track.

Tramway and Vehicle Workers' Conference.—A Conference of the Amalgamated Association of Tramway and Vehicle Workers was held in Birmingham on May 28th. Referring to the affiliation with the National Transport Workers' Federation, Mr. E. H. Bawden, in a presidential address, said the Society by that act had attained a position of power and influence second to none in the country. He mentioned that they had applications pending for the extension of the 12½ per cent. to all tramway workers, and for bringing up the rates paid to women employés to a standard equal to that of the men. On the subject of Industrial Councils, the speaker pointed out that they would not serve with the Municipal Employés' Association, because it was felt that as they accepted employés eligible for membership of their Societies it was an unnecessary addition of trades.

The assistant secretary said the executive and headquarters were in sympathy with the effort to eliminate non-Unionists, but it was probable that that would be secured by the formation of Industrial Councils without their having any friction with any particular management. It would then have to be a condition of employment that employés must automatically become members of their Trade Union.

On the question of women drivers, the general secretary said that several interviews had taken place with the National Service Department officials; but the Executive of the Association had taken a definite stand on the matter, and decided that under no circumstances would it give permission for the employment of women as drivers of tramway cars. The National Service Department had promised to consider the question of placing the tramway industry in the list of protected occupations and of fixing an age limit.

Tramway Statutory Maximum Fares.—In reply to a question in the House of Commons, on Monday, as to what action the B. of T. proposed to take on the report of the Select Committee on Gas Undertakings (Statutory Prices), Sir Albert Stanley said he proposed to introduce a Bill as soon as possible to give effect to the recommendations of the Select Committee. The Bill would include provisions of a like nature in respect of tramway and electricity undertakings.

TELEGRAPH AND TELEPHONE NOTES.

High-Speed Wireless.—According to the *Telegraph and Telephone Age*, the Marconi Co. has applied the principle of Wheatstone transmission to radio-telegraphy. The signalling perforations are punched in ordinary Wheatstone tape, as in landline or cable signalling; the tape is then passed through a Wheatstone transmitter operated at the desired speed. The transmitter, instead of sending the signals directly to line, as in landline working, actuates a pneumatic engine, opening and closing air valves and releasing air under pressure provided by an air pump. Tubes are led from the pneumatic engine to signalling keys specially designed to break high-tension circuits. The extremely rapid movement of the pneumatically operated contacts makes it practicable to transmit signals at speeds exceeding 100 words per minute, without introducing troublesome arcing at contact points in the high-tension circuit.

Hull Telephones.—In order to meet the expenditure on war bonuses, &c., telephone rentals are to be increased. The annual report by the manager (Mr. Holme) states that the gross profit amounts to £18,933, compared with £22,747 last year, a decrease of £3,812, of which £2,400 is accounted for by additional war bonuses, and the balance by a decrease in revenue and increase in maintenance charges. The latter are higher due to increased cost of materials and the laying of a relief cable across the river, necessitated by the number of faulty lines east of the river. During the war there has been a net decrease of 1,500 instruments in service. When the transfer of the system to the Corporation took place it was estimated that there would be a net revenue of £5,300 per annum, after paying the interest and loan charges, and this was realised for the year ending March 31st, 1917. The accounts for the year ending March 31st, 1919, will show a considerable loss.—*E. Morning News.*

United States.—A resolution asking President Wilson to assume immediate control of the telegraph companies of the country, in view of the possibility of a strike of telegraphists, was passed by the American Federation of Labour.—*The Times.*

CONTRACTS OPEN AND CLOSED.

OPEN.

Cavan.—The Clerk of the B. of G. having reported that the contractors in connection with the electric lighting installation had refused to sign the bonds, it was decided to re-advertise.

Dublin.—July 4th. Electricity Supply Committee. Coal-crushing plant. See "Official Notices" to-day.

London.—FULHAM.—July 10th. Borough Council. Cables, ducts and accessories for the linking-up of the Fulham and Hammersmith Electricity Works. See "Official Notices" June 21st.

Morecambe.—Electric Light Committee. 2,000 tons of rough slack. See "Official Notices" June 21st.

New Zealand.—WELLINGTON.—July 1st. Public Service Tender Board. 9,290 electric lamps (Indent No. 4,336). Some particulars may be consulted at the Inquiry Office of the Department of Overseas Trade (Development and Intelligence) in London.

CLOSED.

Calcutta.—The Municipal Council recommends for acceptance the tender of the Russa Engineering Works, Ltd. (Henley's Wiring and Accessories) amounting to Rs. 11,494 for an electrical installation at the markets on the following conditions:—

That all wiring, lamps and fittings, necessary for the complete installation as tendered for, be delivered by the contractors to the Corporation Central Stores within one week of the acceptance of the tender.

That the contractors guarantee the wiring and accessories (excepting lamps and fans) for three years from the date of the completion of the work, and make good all defects arising during this period owing to faulty workmanship or defective material.

That the wiring work be subject to the approval of a responsible representative of W. T. Henley's Telegraph Works Co., Ltd.

Government Contracts.—List of new contracts placed in May, 1918:—

WAR OFFICE.

Ebonite sheet and rod.—Siemens Bros. & Co., Ltd.
Electric lighting sets.—Day Motor Co., Ltd.; West Ham Corporation Electric Supply.
Generating sets.—Austin Motor Co. (1914), Ltd.; British Westinghouse E. & M. Co., Ltd.; Buffalo Forge Co., Ltd.; Electromotors, Ltd; Keighley Gas & Oil Engine Co., Ltd.; R. A. Lister & Co., Ltd.; Parsons Motor Co., Ltd.; Rhodes Motors, Ltd.; Siemens Bros. Dynamo Works, Ltd.
Motors, &c.—Crypto Electrical Co.; Electrical Apparatus Co., Ltd.; Electric Construction Co., Ltd.; F. Parkinson & Co.; Phœnix Dynamo Manufacturing Co., Ltd.
Switchboards.—Veritys, Ltd.
Switchgear.—British Thomson-Houston Co., Ltd.
Trucks.—Edison Accumulators, Ltd.
Works services, electrical.—Pritchett & Gold and Electrical Power Storage Co., Ltd.

INDIA OFFICE.

Cells.—J. Stone & Co.

H.M. OFFICE OF WORKS.

Engineering services.—Electric wiring, Ministry of Pensions Buildings, Burtons Court, Chelsea.—S. Reed & Sons. Lift, National Physical Laboratory, Teddington.—Waygood-Otis, Ltd; Motor-generators, &c., National Physical Laboratory, Teddington.—Mather & Platt, Ltd.; Vickers, Ltd.: Electric wiring, National Physical Laboratory, Teddington.—T. Clarke & Co.; Switchboards, National Physical Laboratory, Teddington.—Ferguson, Pailin & Co.; Electric lighting and power wiring, Plymouth Grain Stores.—Alpha Manufacturing Co., Ltd.

POST OFFICE.

Repairing wire apparatus.—Wynn, Timmins & Co., Ltd.
Telegraph apparatus.—British L. M. Ericsson Manufacturing Co., Ltd.
Telephone apparatus.—British L. M. Ericsson Manufacturing Co., Ltd.; Western Electric Co., Ltd.
Iron Brackets.—Bullers, Ltd.
Submarine cable.—Telegraph Construction & Maintenance Co., Ltd.
Telegraph and telephone cable.—B. I. & Helsby Cables, Ltd.; W. Geipel and Co.; General Electric Co., Ltd.; Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; C. Macintosh & Co., Ltd.; Peel-Conner Telephone Works, Ltd.; Pirelli-General Cable Works, Ltd. Siemens Bros. & Co., Ltd.; Union Cable Co., Ltd.; Western Electric Co.
Cases for telegraph sets.—Sabey & Son.
Cords for telephones.—Siemens Bros. & Co., Ltd.; Western Electric Co., Limited.
Insulators.—J. Bourne & Son; Bullers, Ltd.; Doulton & Co.; J. Macintyre and Co., Ltd.; Taylor, Tunnicliffe & Co.
Earth plates.—Walls, Ltd.
Solder.—E. Austin & Sons.
Cable suspenders.—P. Huntington & Co.
Flame-proof wire.—C. Macintosh & Co., Ltd.
Galvanized iron wire.—Shropshire Iron Co., Ltd.

Hull.—Electricity Committee :—

Stirling Boiler Co.—Boiler.
Ings Foundry, Wakefield.—Stoker.

Ipswich.—Corporation Electricity Committee :—

Brush Electrical Engineering Co., Ltd.—3,000-KW. Brush-Ljungström steam turbo-alternator, condensing plant, &c., £19,160.

The Committee has power to purchase the remainder of the plant and machinery required for the carrying out of the complete scheme.

FORTHCOMING EVENTS.

Physical Society of London.—Friday, June 28th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. General meeting.

Electrical Power Engineers' Association (Northern Division).—Saturday June 29th. At 6 p.m. Inaugural meeting of Glasgow and District Branch at Central Halls, 25, Bath Street, Glasgow.

Chief Technical Assistants' Association.—Thursday, July 4th. At 6.15 p.m. At Anderton's Hotel, Fleet Street, E.C. Discussions on "Distribution Faults and their Location," and on "Voltage Regulation."

Salford Technical and Engineering Association.—Saturday, July 6th. Visit to Messrs. Crossley Motors, Ltd., Manchester.

OUR HALF-YEARLY INDEX.

As it is necessary to effect every possible economy in paper consumption, the Index to Vol. 82 of the ELECTRICAL REVIEW, which will be printed in the course of a few weeks, will be supplied only to those who, through the post, specially apply for it. To such it will be supplied for 3d., post free. Any reader or advertiser at Home or Abroad, who requires a copy for binding, or for other purposes, is asked to make application therefor promptly to the Publisher, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

NOTES.

Keighley Association of Engineers.—At the annual meeting, last week, the membership was reported to be 242, an increase of 34. Mr. H. Widdop was elected president; Mr. Robert Hudson, secretary; Messrs. Alfred Smith, A. D. Lund, J. Whitehead, and Walter Smith to the Council; Prof. G. F. Charnock (head of the engineering department, Bradford Technical College), honorary life member; and Mr. John R. Widdop an honorary vice-president. In the course of an address, Mr. Walter Slingsby urged the need for greater development of physical and chemical laboratories in engineering works.

Electrical Power Engineers' Association: Northern Division.—A special general meeting of the above Division was held at Manchester on Tuesday, June 18th, the President (Mr. A. L. Lunn, A.M.I.E.E.) in the chair. The report of the Salaries Sub-Committee was presented and adopted. Mr. W. A. Jones, A.M.I.E.E. (hon. sec. of the London Division), was present, and gave an address on the rapid growth of, and the work being done by, the various divisions. He reported that the E.P.E.A. had been invited by the Ministry of Labour to send representatives to a meeting, held at Manchester on June 19th, to consider the formation of a council in connection with the Whitley Report.

The chairman reported being present at the mass meeting called by the I.E.E. at Leeds the previous week, to further the promotion of a new Association for the technical staffs of electricity supply undertakings, which meeting resulted in a victory for the E.P.E.A. The Assistant Hon. Sec. (Mr. A. O. Holt) reported that arrangements had been made to hold an inaugural meeting at Central Halls, 25, Bath Street, Glasgow, on Saturday, June 29th, with the object of establishing a branch of the E.P.E.A. for Glasgow and district. A hearty invitation is extended to all interested engineers to attend this meeting. The Hon. Sec. (Mr. J. W. Thomas) reported the formation of a branch of the E.P.E.A. at Liverpool.

Industrial Reconstruction Council.—The address of this organisation in future will be 2 and 4, Tudor Street, E.C. 4, larger office accommodation having become necessary. The work has been re-organised and divided into sections, superintended by Sub-Committees. Mr. Ernest J. P. Benn remains chairman and administrative chief, Sir Alexander Roger is in charge of the membership section, Dr. William Garnett and Mr. Emil Davies control meetings, and Sir Herbert Nield, K.C., M.P., is Parliamentary representative. The Council is also extending the work of propaganda through other organisations, and is now prepared to send speakers to any societies to lecture or initiate discussions upon the various aspects of the Whitley Report. Applications should be made to the Secretary, who would also be glad to supply literature for distribution.

Prize for Paper on the Co-ordination of Research.—The Council of the Institution of Electrical Engineers is prepared to receive papers on the subject of "The Co-ordination of Research in Works and Laboratories," with a view to the paper being read and discussed at one of the ordinary meetings of the Institution in London, and also before one or more of the Local Sections. Papers should not exceed 15,000 to 20,000 words in length, and the Council is prepared to award a special premium of £25 to the author of the paper which, in its judgment, best fulfils the objects of the discussion, provided such paper reaches the standard aimed at by the Council.

Papers should be sent to the Secretary of the Institution not later than November 4th, 1918. It is the intention of the Council to publish the selected paper (which will become the property of the Institution) in the *Journal*, together with the discussion. Competitors intending to submit papers are invited to communicate with the Secretary.

Volunteer Notes.—LONDON ARMY TROOPS COMPANIES, VOLUNTEER ENGINEERS.—Headquarters: Balderton Street, Grosvenor Square, W. 1.

Corps Orders No. 26 by Lieut.-Colonel C. B. Clay, V.D., Commanding.
Captain of the Week.—Capt. W. Darley Bentley.
Next for Duty.—Capt. E. G. Fleming.
Monday, July 1st, to Friday, July 5th.—Drills as usual.
Sunday, July 7th.—Commandant's Parade at Waterloo Station, 8.45 a.m. Work: Revetments at Heywood. Dress: Service dress, drill order, with haversacks and water bottles. Mid-day and tea rations to be carried.

C. HIGGINS, *Capt.* R.E., *Adjutant.*

Self-Government for After-War Industry.—In a letter to the *Times*, Mr. A. H. Paterson, Secretary of the National Alliance of Employers and Employed, says :—"The failure of the Admiralty to recognise the Trade Unions in connection with the scheme they are endeavouring to carry out for the creation of Whitley Committees in the dockyards, and the delay on the part of the Postmaster-General in applying the Whitley scheme to the great organisations under his control, are two very disquieting signs to those who realise the vital necessity of a genuine reconstructive programme. It is the strong conviction of the many leading employers and Trade Unionists who have found common ground in the National Alliance of Employers and Employed that after-war industry must have self-government, and that the basis of that self-government must, and can, be arrived at by the representatives of employers and employed working together with an equality of representation, and free from outside interference. There are three parties concerned—Capital, Labour, and the community. The *rôle* of the State must simply be that of a policeman guarding the interests of the community. The Whitley Report was welcomed by this Alliance as a step (though only a step) in the right direction, but we have consistently urged the inadequacy of those proposals, in that they are neither wide enough in their scope, nor do they sufficiently realise that industrial reconstruction must be a matter for industry itself, and not for State Departments. This Alliance, by the work of its Central and Local Joint Committees (on all of which employers and employed are equally represented), is proving that it is possible to get these two parties to co-operate in working out plans for the industrial future. Through that co-operating work they are reaching a mutual understanding and a realisation of the fact that their interests are identical, and not antagonistic, and they are agreed that along these lines the industrial future can be secured. But they are equally agreed that the task of reconstruction is one to be carried out by the industrial forces themselves. The attitude of the Admiralty and the Postmaster-General in regard to the Whitley Report justifies the position which the National Alliance of Employers and Employed has taken up, and these incidents will have had their value if the lessons they teach are heeded."

Notes from Spain.—Our Spanish correspondent writes :—*The Duero Waterfalls Co.*—Representatives of the Bank of Bilbao and of the Duero Waterfalls Co. visited King Alfonso on June 11th, with the view of interesting his Majesty in the formation of the above company with a capital of 150,000,000 pesetas (£6,000,000 at pre-war rates).

The project has as base the utilisation of the big Duero waterfalls, which will permit the use of energy to the extent of 150,000 H.P. A scheme of this magnitude, working at a daily load factor of 40 per cent., would prove a saving to Spain of approximately half the amount of coal now imported. It is proposed to establish a network of overhead transmission lines covering the central provinces of the Peninsula.

Cantabrian Waterfalls Syndicate.—A company has been formed in Bilbao to exploit waterfalls on the Rivers Pao de Trave and Ponton, in the province of Leon.

Water-Power Committee.—The Board of Trade has appointed the following Committee to report upon the water-power resources of the United Kingdom and the extent to which they can be made available for industrial purposes :—Sir John F. C. Snell (chairman), Mr. G. S. Albright, Sir Dugald Clerk, Dr. J. F. Crowley, Mr. H. F. Carlill (Board of Trade), Mr. Philip Dawson, Prof. Gibson, Mr. Vernon Hartshorn, Dr. H. R. Mill, Mr. A. Newlands, Mr. G. C. Vyle (Associated Chambers of Commerce), Mr. A. J. Walter, K.C., Mr. Ralph Walter (Ministry of Reconstruction), and Mr. D. J. Williams. Mr. R. T. G. French is secretary, and all communications should be addressed to 10, Princes Street, Westminster, S.W. 1.

Was the Liquidator Liable?—In the City of London Court, on June 25th, before his Honour Judge Atherley-Jones, K.C., a claim was made by H. D. Crewe & Co., trading as Crewe, Allen and Co., 23, Chapel Street, Cripplegate, against Mrs. Stanley Kuhn, trading as D. A. Bessent & Co., 74, Watling Street, for £9 8s. for wiring and fitting a motor at Red Lion Court. Defendant said she was not liable, and that the debt was due from Mr. H. W. Sanders, the liquidator of E. Sandler & Co., Ltd., who had sent plaintiffs a dividend of £2 7s., and who was brought in as a third party. Plaintiffs said they returnedlthe money, as they knew nothing of the liquidation. Judgment was given for the plaintiffs against the defendant, the third party being dismissed from the litigation.

Electric Power Supply.—A deputation of the Trade Union Parliamentary Committee recently waited on Sir Albert Stanley, President of the Board of Trade, to ask his opinion regarding the proposals made by the Committee on Electric Power Supply. In his reply, Sir Albert said the Government looked upon the question as one of the many important problems of reconstruction. A Bill for its consideration was to be introduced as soon as possible in the House of Commons. He had not a vestige of doubt that there was an opportunity in the future for everybody to secure for himself a supply of electricity at a very cheap rate.—*Yorkshire Post.*

A Question of Competition.—The following letter was received after our "Correspondence" columns were closed :—

"With respect to the two letters appearing in your issues of May 31st and June 14th under this heading, I am instructed by my Council to forward you a copy of the resolution arrived at by my Executive Committee on May 30th :—

"'The secretary brought forward letter from Messrs. Watson, Marsh & Co. complaining of the action of ——— Electric Supply, and asking for assistance ; the secretary was instructed to say that if the firm would make an appointment to meet the solicitors, bringing with them any evidence that they had, either verbal or in writing, the solicitors would go into the matter, and, if thought advisable, the Association would be prepared to take action.'

"As the firm in question have not yet accepted this offer, the Association cannot proceed.

"LEONARD G. TATE,

"*Secretary, Electrical Contractors' Association (Inc.).*

"London, E.C., *June 26th*, 1918."

Oil from Coal.—In the House of Commons, on Monday last, it was stated that the Ministry of Munitions was taking every possible step to increase the production of oil from coal and shale deposits in the country, and of creosote. The work was hampered by the shortage of labour, but very considerable progress had been made.

New Fuel and Light Order.—Copies of the new Household Fuel and Lighting Order have been submitted to all Fuel Overseers and members of Fuel and Lighting Committees to enable them to organise for the work they will be called upon to carry out. There has been a modification of the table of allowances, which in the London area will be as follows :—

Two-roomed flat or apartment, three tons a year ; three rooms, 3½ tons.

Dwelling house or flat exceeding three rooms, four tons for four rooms, and so on, at the rate of one ton per year per room.

Following are the factors for conversion of fuel into coal, gas, or electricity :—Anthracite to count as fuel at the same rate as ordinary coal ; three tons of coke to count as two tons of fuel ; briquettes not sold by weight and not exceeding 2½ lb. in weight to count as 1,000 to the ton ; 15,000 cb. ft. of gas to count as a ton of fuel ; 800 units of electricity to count as one ton of fuel.

The allowance of fuel to be taken as coal shall not be less than 2½ tons, except with the previous assent of the Local Fuel Overseer.

The scale of lighting allowance for dwelling houses is liberal :—

One, two, or three rooms : 7,500 cb. ft. of gas or 100 units of electricity per year.

Four, five, or six rooms : 11,250 cb. ft. of gas or 150 units of electricity.

Seven, eight, or nine rooms : 15,000 cb. ft. of gas or 200 units of electricity.

Ten, eleven, or twelve rooms : 18,750 cb. ft. of gas or 250 units of electricity.

Where gas and electricity are used, the consumer may continue to use both on one ration only, the conversion factor being 750 cb. ft. of gas equivalent to 10 units of electricity ; but the foregoing light allowance may not be converted into fuel. Quarterly proportions are to be taken in the ratios of one-third of the total for either winter quarter, and one-sixth of the total for either summer quarter ; which is to say, that the maximum quarter or the summer half-year must not exceed one-third of the year's supply.

Engineering Wages.—The skilled workers in the engineering trades have asked the Employers' Federation for an increase in wages of 100 per cent. over pre-war rates, while the unskilled and partly skilled workers in the engineering and shipbuilding trades also have made a demand for an increase, which is placed at 10s. per week above current rates. Both claims came before the Committee on Production on Wednesday, and the decision will be made known later.—*Daily Telegraph.*

Phototelegraphy.—Prof. Arthur Korn, a German electrical expert, is said to have invented a system permitting of the sending of photographs by long submarine cables. Korn was the inventor of a system for transmitting photographs by land wires.—*Wireless Press.*

An Electric Organ in Westminster Abbey.—According to the *Sunday Times*, a "Celestial" organ has been presented to the Abbey by Mr. Clarke. It is placed in the triforium of the south transept, above the tomb of Handel, entirely hidden from observation by the congregation seated below. Though in all respects a separate organ, complete in itself, it forms a part of the grand instrument in the choir. By means of an electric cable 200 ft. in length the new organ is connected with the old, and controlled from the same console ; it may be played by itself, or may be used in conjunction with the main organ.

Institution and Lecture Notes.—Institute of Metals.—The annual autumn meeting of the Institute will be held in London on September 11th, when several important papers will be presented for discussion. A ballot for the election of members will be held on July 17th, as a result of which the membership is expected to be brought well beyond the 1,000 mark, and that within the first decade of the Institute's existence. In connection with the ballot, there has just been prepared for circulation to possible members an attractive new membership booklet, containing a detailed statement of the Institute's varied activities ; copies can be obtained from Mr. G. Shaw Scott, M.Sc., 36, Victoria Street, S.W. 1.

Tramways and Light Railways Association.—The tenth annual congress takes place at Caxton Hall, S.W. 1, at 3 p.m., on Friday, July 12th.

Appointments Vacant.—Mains jointer (9d. per hour + 20s. + 12½ per cent.), for the Farnworth U.D.C. Electricity Works ; shift engineer (63s.), for the Tunbridge Wells Corporation Electricity Department ; electrical staff, for the Ordnance Depôts, Aerodromes, and Military Camps in the Southern Command ; jointer wireman for the Curragh Camp Electric Light Station ; two switchboard attendants, for the Northampton Corporation Tramways ; electrical engineer, for the Department of Electrical Engineering, Admiralty. See "Official Notices" to-day.

Water-power in War-time.—According to *Le Génie Civil*, Commandant H. Cahen, at the Civil Engineers' Congress held recently in Paris, spoke on the considerable *rôle* played by water-power in war-time, and said some important results had been obtained. Before the war 750,000 H.P. with a realisable value of 800 million francs was made use of, this being about one-tenth of the total power available, which is estimated to be at least 8 million horse-power. In Switzerland, official statistics published in 1914 prove that the water-power used there is 16 per cent. of the available total. In August, 1915, a start was made to intensify the resources of water-power, and manufacturers made, at the request of the Under Secretary for War Materials, great efforts in spite of many difficulties. Since the end of 1915, the falls which had been or were in the course of development, represented at least 565,000 H.P., and those actually in harness represented 850,000 H.P. Further, at the end of 1917, 120,000 H.P. was placed at the disposal of the National Defence ; 330,000 H.P. was harnessed in 1918, and the remainder will be completed during 1919 and 1920. This great effort was responded to by nearly every part of France, as the following table indicates :—

Alps	428,000 H.P.
Central Plateau	200,000 "
Pyrenees	185,000 "
Jura and Vosges	35,000 "
West	2,000 "
Total	850,000 "

By the end of 1921, France will have at least 1,600,000 H.P. under control, representing a value of 1,500 million francs. Interesting and fruitful efforts were made by those concerned in the use of energy derived from newly developed water-powers, some for electrochemical, some for electrometallurgical purposes, and others by utilising directly the static pressure of the water of the higher falls to operate presses in the manufacture of rough shell forgings. These results could not have been obtained without the unity which reigned between manufacturers and the interested authorities. Numerous special authorisations to commence work were given, without waiting for formalities or the results of formal inquiries. Water-power has, therefore, rendered great service to the National Defence, and it can be said that all developments of water-powers bring about a corresponding decrease in coal consumption. During the few years preceding the war, water-power was developed to the extent of 750,000 H.P. ; at the same time coal consumption increased by 24 million tons, and this in spite of a drop of 20 million tons in the national output of coal. On the other hand, it can be said that if this 750,000 H.P. had not been developed, this deficit would have been considerably greater. The development of water powers creates other needs which necessitate simultaneously a greater output of coal.

The Electrolytic Recovery of Tin.—For detinning tin cans the affinity of chlorine gas for tin can be made use of, as follows:—The scrap tin waste is charged into large iron vertical cylinders, after being lightly bundled into billets. These billets rest on gratings arranged at suitable intervals in the iron cylinder. Dry chlorine gas is then admitted under a slight pressure into the cylinder, and combines with the tin on the scrap to form tin tetrachloride (Sn_2Cl_4) as a fuming liquid, which is collected in a tank arranged at the base of the cylinder. It is of the utmost importance that the chlorine should be perfectly dry, otherwise it would attack the iron cylinder and other apparatus. To effect this in practice it is usual to compress the chlorine gas over concentrated sulphuric acid. It is also necessary that every care should be taken to prevent the escape of chlorine gas, owing to its poisonous properties. The tin tetrachloride produced by this method can, if necessary, be electrolysed to form tin and stannous chloride.

By another process the tin from the scrap is dissolved in an aqueous solution of tin tetrachloride. The resultant stannous chloride, on being electrolysed, decomposes into tin and chlorine, and the latter re-combines with stannous chloride to form tin tetrachloride, with which further quantities of scrap are treated.

The recovery of tin from stannate solution is, perhaps, the most economical process to adopt at the present time, especially owing to the simplicity of the plant required for this purpose, and also in view of the fact that the materials and solutions required can be readily obtained.

In this process the scrap tin, after cleansing, to remove grease, &c., is charged into suitable containers and immersed in a hot caustic soda solution. Cathodes consisting of iron or copper plates are arranged in the vicinity of the containers, on which the tin is deposited in spongy form; it is removed from time to time and reduced to metallic tin in a special furnace. A plant of this type, requiring about 20 KW. working continuously, is found capable of dealing with about 15 tons of scrap per week, and recovering about 3 cwt. of tin of 98 per cent. purity.

When dealing with the tin can, many other considerations have to be taken into account in connection with the salving of the tinned sheet steel of which it is composed. Such waste contains solder, paper, varnish, fats, rubber, and other organic matter, all of which have to be removed before treatment. In dealing with the last material, it is necessary first to perforate the tins by passing them through suitable rolls. They are then washed in a caustic alkali solution to remove organic matter, and transferred to an electrolytic detinning bath by means of drums which are revolved mechanically in a solution of sodium stannate. The tin is deposited on cathodes arranged radially on either side of the immersed section, the sizes of vats and drums being designed according to the tonnage for treatment. The solder is extracted in a desoldering furnace, provided with means of obtaining a neutral or non-oxidising atmosphere in contact with the scrap, in order to avoid excessive oxidisation, and, when a clean steel is obtained, hydraulic or mechanical presses are used for pressing the steel into blocks.

For the recovery of tin deposited on the cathodes, it is suggested that the powder be formed into briquettes, consisting of tin, charcoal, salt, and a small quantity of resin. These briquettes are reduced in a lignating furnace, the residual slag being ground up and re-dissolved in water to recover any alkali remaining.

The organic matter recovered from washing tanks is run into settling backs, after which it is rendered down and refined. Any solid matter is skimmed off the surface of the tank, and residual sediment can be removed from a false bottom.—*Salvage.*

Electric Precipitation.—According to the *Journal of Electricity*, an electric precipitation process has enabled the U.S.A. cement workers to obtain potash from the residue dust. In one case a year's trial under practical operation has resulted in the rather astonishing result of having a greater income from potash than from cement. Operating costs show conclusively that the process will be profitable at pre-war prices, and that a supply of potash for fertiliser as well as ammunition is now assured.

Sound-Range Telephones.—Major-General J. Franklin Bell, U.S.A., who has lately returned from an inspection trip on the front in France, has imparted to the Senate Military Committee the results of his observations, among which the *Electrical World* notes the success of the new sound-range telephone system for ascertaining the positions of enemy guns. The Germans captured one of the telephones, and are now also using the system. General Bell says:—

"All armies now employ scientific methods of locating guns, one of which is known as the sound-ranging method. Briefly, they have observers scattered along a curved line which has been accurately measured, and all of these observers, of whom there are usually six, utilise electrical sound-ranging apparatus by which they report instantaneously the moment they hear the sound of a gun explosion. At a central point another electrical apparatus records these sounds from the six different stations, and by a scientific method they combine the knowledge gained from these six points, and succeed in locating with a remarkable degree of accuracy the position of the gun that made the explosion when it was fired.

"Each side has a type of telephone which is able to hear distinctly over very considerable distances conversations not intended for the listener, and for a long time the Allies employed this system of gaining information without the knowledge of the enemy; but the Germans captured one of these instruments and discovered that their conversations in the trenches had been listened to for quite a while, and that the Allies had thus gained some information in a way that had long puzzled the Germans."

Patents and Alien Enemies.—Application has been made by the James Keith & Blackman Co., Ltd., to the Board of Trade to avoid or suspend Patents Nos. 22,433/10, 27,696/11, and 1,382/13, granted to Theisen, for apparatus for purifying and cooling gases.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—At the Keighley T.C. meeting last week, the Tramways and Electricity Committee sought power to appoint an assistant electrical engineer and tramway manager at a commencing salary of £200 per annum. An amendment was moved that the two positions should not be bracketed, and that the position be that of assistant electrical engineer only. The amendment was defeated by a large majority, but an amendment leaving the question of salary with the Committee was carried.

MR. F. WINDOWS has been appointed mains superintendent by the Hull Electricity Committee.

The King's Lynn T.C. has decided to grant the electrical engineer a further bonus of £40 per annum for the duration of the war. The Chief Industrial Commissioner had intimated to the Corporation that it was not compelled to pay him the 12½ per cent. bonus.

MR. A. R. TUDMAN, who has been the engineer in charge of the Colwyn Bay Council's electricity undertaking since it was opened nearly 20 years ago has tendered his resignation on being appointed to an important post under a Manchester firm.

Bexhill E.L. Committee has decided to increase the salary of the engineer (MR. C. A. FROST) from £300 to £350.

The Bolton E.C. has voted increased salaries to MR. B. S. HORNBY (chief assistant engineer) from £280 to £310 per annum, and MR. H. E. ANNETT (resident engineer) from £280 to £310 per annum.

General.—We have received the following letter:—"May I make a correction in regard to your notice, on the 7th inst., of the conviction of Mr. Harrison Barrow, for an offence under the D.O.R.A.? The alderman presiding at the Guildhall agreed that the statement of authorship on the leaflet was sufficient. It was, therefore, *only* for carrying out the refusal of the Society of Friends to submit to the Censor the publications which it thinks it right to issue that Mr. Barrow was convicted.—JOSEPH STURGE, Birmingham, June 18th, 1918."

On Saturday last, at St. Matthew's Church, Surbiton, CAPTAIN A. C. SPARKS, M.C., eldest son of Mr. C. P. Sparks, Past President of the I.E.E., was married to Miss Sybil Fuller.

The desire to attack all and sundry once more came into evidence in the House of Commons, on Wednesday, when Mr. Pemberton Billing asked whether Sir Albert Stanley, the President of the Board of Trade, was a German of the name of Knattries. It was shown, in reply, that Sir Albert's father and mother were born in Derbyshire of English parents. They left this country for America when he was a child, and later the name was changed from Knattries—a good old English name—because it was difficult to remember and pronounce. Sir Albert stated that the family had resided in Derbyshire for many generations.

Roll of Honour.—According to the *Times*, SECOND-LIEUT. E. B. RITSON, M.G.C., who has fallen in France, entered Faraday House in 1902. In May, 1905, he received an appointment with the Mexican Light and Power Co., and after two years as engineer at Necaxa, he returned to England and joined Callender's Cable and Construction Co., Ltd., where he was employed when the war broke out.

AIR MECHANIC C. FOSTER, R.F.C., who has died in hospital at Lincoln from appendicitis, was an apprentice with Mr. James Batty, electrician, Burnley.

PRIVATE L. HOLLAND, L.N. Lancs. Regiment, who has been killed in action, was an electrician with Messrs. J. Lomax Kendall and Co., Ltd., Manchester.

PRIVATE E. THACKRAY, Lincolns, who is a prisoner of war, was employed by Mr. C. Franklin Tubb, electrical engineer, Leeds.

GUNNER FRED WHEELHOUSE, R.F.A., who has been awarded the Military Medal for carrying dispatches under heavy fire, was on the staff of the Leeds Corporation Tramways Department.

PRIVATE P. TOOLE, K.O.R.L. Regiment, who has died from wounds, was employed at Blackburn Electricity Works.

PRIVATE T. FOX, Lewis Gun Section, Manchester Regiment, killed in action, was employed by Messrs. Charles Macintosh & Co., Ltd., Manchester.

PRIVATE C. R. REED, Lancashire Fusiliers, who has died of wounds, was an electrical engineer on the staff of a firm at Bath.

GUNNER W. H. GARBUTT, R.F.A., who was before the war a fitter at the New Cross tramway depôt, has been awarded the Military Medal.

QUARTERMASTER-SERGEANT T. H. CLARKE, Border Regt., who was an electrical engineer at the Keswick E.L. Works, has been killed in action.

GUNNER C. PEACOCK, R.G.A., who has fallen in action, was with Messrs. Elliott Bros., Lewisham.

CORPORAL J. JAMES, Shropshire Light Infantry, formerly an electrical engineer at Blaengwynfi, South Wales, has been killed in action.

LANCE-CORPORAL G. COX, employed at the Carron Works, Falkirk, has been awarded the Military Medal.

LANCE-CORPORAL A. C. HINDER, an electrical machinist at the South Wales Steel Works, is a prisoner of war.

CAPTAIN and TEMPORARY MAJOR N. H. HAMILTON, R.A.F., who is an electrical and wireless engineer, has been awarded the D.S.O.

QUARTERMASTER-SERGEANT ROWLAND DE VILLE, of the R.F.A. (Stafford Battery), who has been mentioned in dispatches, was in the drawing offices of Messrs. Siemens Bros.' works at Stafford.

CAPTAIN J. HOLMES, who was in the employment of the Central Electric Supply Co. at the Grove Road power station before the war, has been awarded the Military Cross for gallantry during the German offensive in March.

Obituary.—The death has occurred of MR. F. G. MICKLEWRIGHT, electrical engineer, Maidstone. Deceased was 40 years of age, and died from injuries sustained through a motor lorry, in which he was sitting, dashing into a shop front, Mr. Micklewright being crushed between the vehicle and the building.

MR. JOHN BOTTOMLEY, who passed away in New York on June 16th, was vice-president, secretary, and treasurer of the Marconi Wireless Telegraph Co. of America, and brother of Dr. J. T. Bottomley, F.R.S., of Glasgow.

Will.—The late MR. ROBERT S. BLACKWELL, chairman of R. W. Blackwell & Co., Ltd., and of Johnson & Phillips, Ltd., left £91,288 gross and £90,890 net personalty.

NEW COMPANIES REGISTERED.

Thomas Smith & Sons (Rodley), Ltd. (150,707).—Private company. Registered June 12th. Capital, £150,000 in £1 shares (50,000 pref.). To take over the business of mechanical and electrical engineers carried on at the Steam & Electric Crane Works, Rodley, near Leeds, as Thomas Smith & Sons, also to carry on the business of tool makers, iron and steel converters, woodworkers, builders, painters, &c. The subscribers (each with one share) are:—F. H. Smith, Springville, Shaw's Lane, Leeds, engineer; W. T. Smith, Mayholme, West Park, Leeds, engineer; G. E. Smith, Wymoor, Ancester Road, Leeds, engineer. The first directors are: F. H. Smith, W. T. Smith and G. E. Smith. Qualification, £500 shares. Registered office: The Steam & Electric Crane Works, Rodley, near Leeds.

Metallic Electrodes, Ltd. (150,675).—Private company. Registered June 7th. Capital £10,000 in 9,500 ord. shares of £1 each and 30,000 def. shares of 6d. each. To carry on the business of reconstructing by agglomerating, restoring, and otherwise utilising metal trimmings, sawings, turnings, and scale of metal and scrap, and any other waste of metal, china, glass, pottery, coal, or other substance, &c. The subscribers (each with one ord. share) are:—J. G. Mason, 26, Dalebury Road, S.W., secretary; A. P. Kirkaldy, 3, Chislehurst Road, Richmond, Surrey, stockbroker. Permanent directors: T. Rouse and W. S. Leefe. W. S. Leefe's address is 23, Coleman Street, E.C.

Taranto Tramways & Electric Supply Co., Ltd. (150,704).—Registered June 11th. Capital, £100,000 in £1 shares. To acquire a concession granted by the Municipality of Taranto, Italy, to construct, equip, maintain, and work electric tramways in and around the said city, &c. Agreement with Rhys-Jones, McTaggart & Co. The subscribers (each with one share) are:—Sir Edward Zohrab, Bart., New Walk, Leicester, civil engineer; E. J. Summers, 132, Ferme Park Road, Crouch End, N., secretary; G. T. Weekes, 20, Priory Avenue, Caversham, Oxon., solicitor; H. Pettitt, 18, Austin Friars, E.C., solicitor; A. C. Dowsing, 4, Lardon Road, Acton, W., secretary; W. A. Pittman, 18, Austin Friars, E.C., solicitor's clerk; P. B. Potter, 29, Gubyon Avenue, Herne Hill, S.E., secretary. The first directors are to be appointed by the subscribers. Qualification, £100. Solicitors: Slaughter & Nay, 18, Austin Friars, E.C.

Hightensite, Ltd. (150,736).—Private company. Registered June 15th. Capital, £50,000 in £1 shares. To acquire the business of manufacturing a material called "Hightensite," being a substitute for the German material "Stabilit," a compound of rubber used for magneto and rotary engine distributors, capable of being used for all purposes requiring a high electrical insulation, which manufacture is now carried on as a branch business by the Park Royal Engineering Works, Ltd., at Streatham, S.W. The subscribers (each with one share) are:—A. G. Morrish, 34-6, Gresham Street, E.C., chartered accountant; A. Spurrier, Sussex Grove, Putney Park Avenue, S.W. 15. The first directors are: Sir Lindsey B. Peters, K.B.E., A. Spurrier, A. G. Morrish, V. E. Joyce, and H. G. Morrish. Registered office: 34-6, Gresham Street, E.C.

Trafford Power & Light Supply (1902), Ltd.—Particulars of £65,000 debentures created May 13th, 1918, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the amount of the present issue being £50,000. Property charged: The company's undertaking and property, present and future, including uncalled capital, subject to first mortgage debenture stock for £35,000. No trustees. (Of the £40,000 second mortgage debentures previously registered, a debenture for £25,000 has been postponed and become a third mortgage debenture, and the series of second mortgage debentures has been increased by the above issue, making a total of £65,000 second mortgage debentures.)

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Record Electrical Co., Ltd.—Issue on May 25th, 1918, of £500 debentures, part of a series of which particulars have already been filed.

James Keith & Blackman Co., Ltd.—Memorandum of satisfaction in full on November 11th, 1917, of first debentures dated 1902 and 1910, securing £2,400, (*b*) on May 15th, 1918, of first debentures dated 1907, 1901-7, securing £1,650, and (*c*) on May 15th, 1918, of second debentures dated 1913, securing £250, has been filed.

F. E. Baker, Ltd.—Particulars of £8,600 debentures created June 6th, 1918, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Gloucestershire Electric Power Syndicate, Ltd.—Memorandum of satisfaction in full on May 31st, 1918, of debentures dated February 22nd, 1905, securing £850, has been filed.

Larne Electric Light Works, Ltd.—Memorandum of satisfaction in full on May 25th, 1918, of debentures dated October 13th, 1910, securing £2,200, has been filed.

Memorandum of satisfaction in full on May 29th, 1918, of debentures dated 1896-7, securing £500, has been filed.

Bromley (Kent) Electric Light & Power Co., Ltd. (54,127).—Capital, £100,000 in £5 shares. Return dated April 22nd, 1918. 15,000 shares taken up. £75,000 paid. Mortgages and charges: £64,063.

British Insulated & Helsby Cables, Ltd. (52,285).—Capital £1,000,000 in 500,000 pref. and 500,000 ord. shares of £1 each. Return dated April 8th, 1918. All shares taken up. £572,675 paid on 372,350 pref. and 200,325 ord.; £427,325 considered as paid on the remainder. Mortgages and charges: £700,000.

Alderley & Wilmslow Electric Supply, Ltd. (47,663).—Capital, £30,000 in 20,000 ord. and 10,000 pref. shares of £1 each. Return dated May 15th, 1918. 15,000 shares taken up. £15,000 paid. Mortgages and charges £15,000 (stated on previous returns as £15,000).

CITY NOTES.

Aluminium Corpn., Ltd.

Mr. K. M. CLARK, presiding at the annual meeting last week, said that in the interests of general efficiency the general office had been removed from London to the works in North Wales, where they continued to consolidate the business. The carbon works were removed from Wallsend to North Wales some years ago, with satisfactory results, and they now had a rolling mill in work upon the same site as the reduction works. They had purchased the entire share capital of the Aluminium Foil Co., Ltd., and its business was being conducted as a subsidiary. He hoped that in due course they would be able to concentrate all their various processes in North Wales. They hoped in the near future to submit a scheme for funding the three years' preference dividend in arrear. The rainfall last year upon their watershed was 13 in. below that of 1916, and in consequence the output fell short of the previous year's figures, but their efficiency per inch of rain was greater than it had ever been, this result being obtained by the new works they had had in progress. The general progress of the company had continued upon the upward grade. Work had proceeded in the past year upon the construction of the new dam, and upon other work necessary to increase the company's water power, and a considerable amount of property had been acquired to enable the company to obtain the greatest benefits from the water power available. They had been able to keep their necessary stocks of raw material in a satisfactory condition. The rolling mill had proved a great acquisition, and a large and satisfactory business had been done in aluminium sheets. With regard to the future, he was, by the events of the last three years, strengthened in his sanguine view as to the company's prospects. The metal produced had been of great service to the country during the war. There could be no question that the familiarity obtained by so many workers in handling aluminium during the war operations, and the extreme usefulness it had been proved to possess, would remove a great deal of the prejudice that was previously experienced against its introduction in many commercial fields. Personally, he felt that the electrical industry, the chemical and brewing trades, and also vehicle manufacturers would make much freer use of aluminium on the return of peace than they did prior to the war. Of course, the world's output had been very largely developed. It was, in fact, estimated at about five times the quantity produced 10 years ago, but there seemed no reason to doubt that the consumption, both present and future, was quite able to take care of even a larger output than had yet been produced. The British Government had recognised that aluminium was a key industry of great national importance, and they had shown by their actions that they considered it essential for the future welfare of this country that the home production should be substantially increased. The costs of production had shown large increases. The seaborne freight of their raw material had been very heavy, and, in fact, the keeping up of necessary supplies would have been impossible had they not received very hearty support from both the British and French Governments. With a view to increasing the productive capacity of the works, they had arranged to increase the capacity of the sheet rolling mill. A power press had been installed. The purchase of shares in the Aluminium Foil Co., together with other developments in hand, would enable them in the near future to market the whole of their output in a more finished form than had hitherto been possible. The return of peace would, of course, not mean the immediate return of normal conditions. A period during which inflated costs and shortage of materials would prevail must be experienced.

Kalgoorlie Electric Power and Lighting Corpn., Ltd.

At the annual meeting, Mr. E. POPE, the chairman, said that the profit was £2,906 less than for 1916. The decrease was a measure of the depreciation which had taken place in the prospects of Kalgoorlie, due largely, but not entirely, to war conditions. There was a decrease beyond their anticipation in the profit made during the last four months of the year, and they were obliged to notify that no dividend could be paid in

April this year. He was unable to say when the financial position would permit of another payment, but immediately there was sufficient money available a distribution on the preference shares would be made. Present conditions in Kalgoorlie tended to decrease receipts and to increase costs; it seemed unlikely that there would be any beneficial change during the war. Until the end they must do their best to carry on at a profit, with dividends if possible, but they might have to strive hard to pay their debts and heavy taxes, and carry on till better times again prevailed. The cabled results of gross profits for the five months of this year showed a decrease of £1,792. Their future was intimately bound up with that of the Kalgoorlie goldfield.

Oriental Telephone and Electric Co., Ltd.

For the year ended at December, 1917, the gross earnings, including dividends and interest from subsidiary companies, &c., were £110,420, plus, several items bringing up the total to £133,360. The working expenses, maintenance, &c., were £49,607, and after paying debenture interest and redemption charges, paying the preference dividend, also a total dividend of 10 per cent. on the ordinary shares and a bonus of 1s. per share free of tax, £25,000 is put to general reserve, £2,000 to staff pension fund, and £17,196 is carried forward.

The company's exchanges show additions in the number of stations connected up during the year, with a corresponding increase in revenue. Additions are, however, small when compared with developments in previous years, owing to the prohibition by the Government of India of new work, and to the difficulty in obtaining supplies of material. Applications for connections have been received from a large number of new subscribers, and although for the time being development is almost at a standstill, the future prospects of the company appear to be satisfactory. It is anticipated that the reconstruction of the Singapore building will be completed by the end of the current year, and the new exchange equipment is promised for delivery in Singapore at about the same time. Considerable expenditure on buildings, exchange equipment, cable installations, renewal of line construction, instruments, &c., will be necessary in Madras, Rangoon, Singapore, and Mauritius when normal conditions are restored, as well as additions to capital account for new installations.

No addition has been made to the reserve for depreciation, the directors being advised by the company's consulting engineers that the sum of £40,000 already standing to the credit of this account is sufficient to meet depreciation up to December 31st, 1917.

The Bombay Telephone Co. and the Bengal Telephone Co. show increased revenues for the past year. The Bengal Telephone Co. has paid the same dividend as for 1916, viz., 7 per cent. The Bombay Telephone Co. has paid a dividend of 16 per cent., as against 12 per cent. for the year 1916. The net revenue in the case of the Telephone Co. of Egypt and the China and Japan Telephone & Electric Co. is somewhat less than for 1916. Both companies are paying their previous rates of dividend, viz., 10 per cent.

As already notified, the Government of Egypt purchased the undertaking of the Telephone Co. of Egypt for £755,000, as from January 1st, 1918. Proposals for the application of these moneys will be made in due course.

At the meeting to-day resolutions will be submitted for increasing the capital to £400,000 by the creation of 100,000 new ordinary shares of £1 each.

Marconi International Marine Communication Co., Ltd.

During 1917 the business continued to show substantial expansion. The gross revenue amounted to £470,658, an increase of £200,476, derived principally from rentals of additional ships fitted. The necessary restrictions in respect of private messages at sea have continued, and prevented revenue being received from this source. The profit is £192,056, from which is deducted £50,000, a necessary allowance for obsolescence of plant, leaving net profit £142,056. In the preceding year the net profit amounted to £96,748. The improvement is about proportionate to the increase of the business.

The balance of the debenture reserve account and the balance of share premium account have been transferred to general reserve, which now stands at £258,009. The losses sustained in consequence of attacks upon the mercantile fleet during the year 1917 have been debited to profit and loss.

The total number of public telegraph stations owned and worked by the company on the high seas increased from 1,472 to 2,265. The organisation of the company, together with that of its associated companies, with a total of some 4,000 mercantile vessels fitted with Marconi telegraph stations, has continued to render inestimable service.

The directors recommend a final dividend of 10 per cent. for 1917, making 15 per cent. for the year.

The Amalgamated Wireless (Australasia), Ltd., in which this company is interested, has paid a dividend of 5 per cent. in respect of the year ending June 30th, 1917.

The increase of the capital of the company to £600,000 was duly confirmed at the extraordinary general meeting held on July 25th, 1917, and the 250,000 new shares were offered to the shareholders at a premium of 15s. per share on August 31st. The issue was over applied for, and allotments were made *pro rata* to the holdings of the applicants.

This increase of capital became necessary in consequence of the decision of His Majesty's Government to make the provision of wireless telegraph apparatus compulsory on all merchant ships of 1,600 tons gross and over, and to require two operators to be carried on all vessels fitted. At the request of the Board of Trade this company undertook to provide the necessary apparatus and trained operators.

Edgar Allen & Co., Ltd.—After paying the preference dividend, putting £20,000 to general reserve, and paying 10 per cent. and a bonus of 1s. 6d. per share (total 17½ per cent.) on the ordinary shares, free of tax, £35,340 is to be carried forward.

Victoria Falls & Transvaal Power Co.—Final dividend of 4 per cent. less tax, on the pref. shares, making 10 per cent. for 1917, and a dividend of 3 per cent., less tax, on account of 1918. Dividend of 5 per cent., less tax, on the ordinary in respect of 1917.

Eastern Telegraph Co., Ltd.—Preference dividend at the rate of 3½ per cent. per annum, less income-tax for the quarter ending June 30th, and a first quarterly interim dividend of 1¼ per cent. on the ordinary stock, free of income-tax.

British Electric Traction Co., Ltd.—Presiding at the annual meeting, on Tuesday, Mr. GARCKE said that they had made more profit than in 1916, and had applied the increased profits made by the associated companies mainly to strengthening the financial position. The greater part of the speaker's remarks, according to the report in the financial Press, dealt with the reports recently issued bearing upon the future of the electricity supply and electrical industry, which he said were, in his opinion, a condemnation of the electrical legislation of the last 36 years. He referred to the condition of the electrical industry before the war as being ludicrous, and inquired how it was that for nearly 40 years they had been unable to get views adopted which now appeared self-evident. He predicted that if the present questions were tackled comprehensively and equitably, the electrical industry after the war would prosper to a surprising extent. Mr. Garcke expressed the view that the pioneers of the electrical industry in this country had had a hard time, but they had made the path easier for those who followed them.

Brush Electrical Engineering Co., Ltd.—Addressing the annual meeting, Mr. GARCKE said that the demand for Ljungström turbo-generator sets and auxiliaries had increased so rapidly that to keep pace with it they had had to arrange for a large extension of their machine-tool equipment. Their friends the British Ljungström Marine Turbine Co., who controlled the marine propulsion rights of that turbine, had made excellent progress. Important orders were now in hand, and they could congratulate themselves on having acquired a valuable asset in this turbine. They were anxious not to pay a larger dividend than they felt confident could be maintained, and therefore suggested that the present distribution of 12 per cent. should be regarded as in respect of the two years in which the dividend had been earned, and that the declaration should be at the rate of 6 per cent. per annum for each of those two years.

Calcutta Tramways Co., Ltd.—Sir H. KIMBER, presiding at the annual meeting, said that the revenue account showed a fall of only £31 in the traffic receipts, due to the reduction in mileage which they were called upon to make before they could obtain Government authority for procuring supplies necessary for carrying on the system. Power expenses were about the same as in 1916. Traffic expenses showed a small increase, maintenance and repairs a decrease, and general expenses an increase. There was a loss of £3,187 on sale of investments. During the current year the traffic receipts had substantially improved, the aggregate increase to date amounting to upwards of Rs. 115,000, but there would be increased running expenses owing to the continual rise in the cost of supplies and the difficulty of obtaining them.

Imperial Tramways Co., Ltd.—The passengers carried on the Middlesbrough, Stockton & Thornaby electric tramways increased from 12,850,555 to 13,219,147, and the net profit from £14,229 to £16,540. Fares were raised by 50 per cent. as from September 1st last. The Imperial Co. holds 125,000 5 per cent. cum. pref. shares and 118,820 ordinary, all of £1 each, in the London & Suburban Traction Co., but the revenue only admitted of the payment of a dividend on the preference shares at the rate of 2½ per cent. The Imperial Co.'s net revenue account allows of a final dividend at 6 per cent. per annum on the preference capital, less income-tax, and one of 2 per cent. on the ordinary capital, less income-tax, carrying forward £143. The death is recorded of Mr. H. C. Godfray, who had been a director for 25 years.

Barcelona Traction, Light & Power Co.—Bondholders are being informed by the committee, appointed in 1915 to watch over their interests, that, owing to the delay and complications resulting from the continuance of the European war, affecting both the delivery and the cost of machinery and other supplies, it will not be possible for the company to resume full payment in cash of the interest on its bonds on December 1st next, as was contemplated when the bondholders met in June, 1915. A plan is being formulated, the basis of which will be the payment in cash of a portion of the interest commencing with the coupon due December 1st, 1918, with compensating arrangements for deferring payments of the full interest.—*Financial Times.*

Waygood-Otis, Ltd.—Mr. H. C. WALKER, at the annual meeting, said that they were engaged on work much of which was of a special character, and new to them. This called for the purchase of additional new and modern machine tools, but these would be useful also for future work when they required to revert to, and to prepare to cope with, the maximum demand in their pre-war line of business as lift manufacturers.

Globe Telegraph & Trust Co., Ltd.—For the year ended May 31st, 1918, the net revenue, after deduction of expenses, amounts to £228,394, plus £55,176 brought forward. There has been transferred to reserve for contingencies £75,000, 6 per cent., less income-tax, has been paid on the preference shares, and a total of 7 per cent., free of tax, on the ordinary shares.

Stock Exchange Notice.—Application has been made to the Committee to allow the following to be quoted in the Official List:—

Tees Power Station Co., Ltd.—£260,000 fully-paid scrip and £340,000 50 per cent. paid scrip for 6 per cent. first mortgage debentures.

Eastern Extension, Australasia & China Telegraph Co., Ltd.—First quarterly interim dividend 3s. per share, free of tax.

Montreal Light, Heat & Power Co.—Dividend 2 per cent. for quarter ending July 31st.

Montreal Light, Heat & Power Consolidated Co.—Dividend 1 per cent. for quarter ending July 31st.

W. & T. Avery, Ltd.—Final dividend 10 per cent. on ordinary shares, making 15 per cent. for the year.

Clarke, Chapman & Co., Ltd.—Interim dividend 2s. per share, less tax.

STOCKS AND SHARES.

Tuesday Evening.

The revival in the Stock Exchange markets continues to make further progress. Thanks to the excellent news from the Italian front, a fresh accession of strength developed in many departments round the House, and amongst these, industrials stood out with peculiar prominence. Elsewhere, home railway stocks advanced, and notable rises have been gained by Mexican issues of all kinds, the bonds of the utility companies shooting up several points at a time. The publication of the report from the Marconi International Marine Co. confirmed the favourable estimates which had been formed in advance of the company's increased prosperity, without, however, affecting the prices in this group to any extent.

The home railway market derives support from tardy recognition of the good returns offered to investors by the stocks. Most of the prices now carry six months' dividends, and in the strength which has accrued to the market for dividend payers, the lower-priced stocks have now participated. In the former group, the Income Bonds of the Underground Electric Co. have risen to 77. Districts further advanced to 18. The fear that the dividend on the income bonds may have to be reduced is now countered by the rumour that fares are to be put up, which also, of course, will affect the District Co. Metropolitan Consolidated also hardened a point. It may be mentioned, incidentally, that the only issue in the list of home railway ordinary stocks and shares which shows an appreciation over the pre-war making-up price of July 27th, 1914, is London Electric Ordinary, which stands now at 2¼ against 30s. four years ago. Districts just before the war made up at 21¾, and Metropolitan Consolidated at 37½, while Central London Assented Ordinary, now quoted at 62½, is still 20¼ points below the quotation at that time.

From the spectacular point of view, the principal rises this week are those in Mexican utilities. Following upon the interview of President Wilson to Mexican journalists about a fortnight ago, there have been several indirect considerations which lead to the inference that affairs in Mexico may be expected to settle down rather sooner than had been thought possible. Thanks to this, Mexico Tramway bonds have gone up 6¼ points, and the Seconds at 34¼ are 4¼ up. Mexican Light & Power Bonds have similarly recovered. Pachuca Fives at 41 are 5 points to the good, and these rises point more to the difficulty that there is of obtaining stock than to any volume of business that has occurred by reason of the changed conditions. Holders naturally are not desirous of parting with their bonds just when there seems to be a possibility of better times ahead, so that it takes comparatively little demand for quotations to advance smartly.

The recent report issued by the Mexican Railway Co. shows conclusively enough that property has suffered to a material extent owing to the revolutionary conditions that have prevailed for the past half decade, but the argument runs that once normal conditions were restored in the country, there would be no lack of money available for putting things to rights if it were shown conclusively that there were ample scope for profitable working of the utility companies.

Other foreign descriptions are generally strong. Brazilian Tractions are 2 points higher, but the Anglo-Argentine group makes no headway. There is still a little activity in Pernambuco Tramways, the price being about 8s. Victoria Falls issues continue to be depressed by evidence, afforded by dividend declarations from the leading mines, of the difficulties that surround industrial working in the Transvaal at the present time—difficulties that are hardly likely to decrease during the progress of the war, unless a substantial scheme of Government support should be formulated. The dividend of 5 per cent. goes against 5 per cent. a year ago, but the ordinary are dull at 17s. 9d., the preference being 23s. 3d. British Columbia Electrics are materially better, the deferred gaining 5 and the preferred 4 points.

In the electric supply group, Chelseas have risen ½ to 3¼, and South Londons advanced to 3, but both Countys and Westminsters are ½ lower. The manufacturing group is still on the up-grade. One feature is the strength of British Westinghouse Preference, which have risen a further 5s. to 2¼. General Electric Ordinary are 1 up at 23, and the Preference improved to 10¼. Electric Constructions, on the other hand, are a little easier at 1 3/16, and Edisons are rather less active, the price going back a trifle to 41s. The latter company's 7 per cent. participating preference was last done at 22s. 1½d. Hydro-Electrics are attracting less attention than they were, the price now being 12s. Cromptons keep good at 15s., and the Preference at 19s. 6d. In the cable list, Callender's gained £1 to 18½, Henleys 5s. to 21½, and India-Rubber Ordinary ½ to 16¾. Rumour continues to play an important part in the strength shown by electrical manufacturing issues, and also in that which has developed amongst some of the iron and steel shares, where Vickers and Armstrongs have been conspicuously buoyant. In the chemical group, Castner-Kellner are ½ higher at 3 7/16, and practically all the industrials in which anything like a free market exists are on the up-grade, the strength imparted to markets by the Italian news providing the latest source of impetus. The rubber market remains quiet, and, if anything, leans a little to the dull side.

Telegraphs and telephones maintain their strength. Westerns have now risen to 16, and stand highest in their particular section. A few Globes came in the other day, and on this the Ordinary lost 5s. Great Northerns are better at 38½. Oriental Telephones and United River Plate Telephones are both better. The Marconi group is steady. The Marine Co. declares the same dividend as that of last year, but the profits are substantially better, and the price keeps about 2 11/16, while the parent shares, after touching 3½, reacted to 3¼. American Marconis at 23s. show no alteration on the week.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1916.	Dividend 1917.	Price June 25, 1918.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	9	10	6¼	—	£7 13 10
Charing Cross Ordinary	5	4	3⅜	—	6 8 1
do. do. do. 4½ Pref.	4½	4½	3⅜	—	6 18 6
Chelsea	3	5	3⅜	+ ¼	8 0 0
City of London	8	8	11½	—	7 2 3
do. do. 6 per cent. Pref.	6	6	9¼	—	6 0 4
County of London	7	7	10½	— ¼	6 16 7
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
Kensington Ordinary	6	7	8½	—	6 13 4
London Electric	Nil	Nil	1½	—	Nil
do. do. 6 per cent. Pref.	4	5	8½	—	7 13 10
Metropolitan	3	4	3⅜	—	6 8 0
do. 4½ per cent. Pref.	4½	4½	3½	—	6 13 4
St. James' and Pall Mall	8	9	6¾	—	6 11 0
South London	5	5	3	+ ⅛	6 13 4
South Metropolitan Pref.	7	7	21/-	—	6 13 4
Westminster Ordinary	7	9	6¾	— ½	7 7 0
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	94½	—	6 7 0
do. Def.	1½	1½	22	—	6 14 10
Chile Telephone	8	—	8½	—	4 17 0
Cuba Sub. Ord.	7	7	9⅜	—	*7 8 7
Eastern Extension	8	8	15⅜	—	*5 1 7
Eastern Tel. Ord.	8	8	169	—	*5 0 4
Globe Tel. and T. Ord.	7	—	14½	— ½	*4 15 0
do. do. Pref.	6	6	10	—	*6 0 0
Great Northern Tel.	24	22	38½	+ ½	*5 14 0
Indo-European	13	—	40½	—	6 5 1
Marconi	15	—	70	—	4 17 10
Oriental Telephone Ord.	10	—	41½	+ ½	*3 5 9
United R. Plate Tel.	8	8	7½	+ ⅛	*5 6 8
West India and Panama	6d.	9d.	1½	—	*3 6 8
Western Telegraph	8	8	16	+ ½	*5 0 0
Home Rails.					
Central London Ord. Assented	4	4	62½	—	6 8 0
Metropolitan	1	1	22½	+1	4 10 0
do. District	Nil	Nil	18	+1	Nil
Underground Electric Ordinary	Nil	Nil	1½	+ ½	Nil
do. do. "A"	Nil	Nil	½	—	Nil
do. do. Income	6	4	77½	+ 1	*5 4 0
Foreign Trams, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	4½	—	6 6 4
Anglo-Arg. Trams. First Pref.	5½	5½	9	—	—
do. do. 2nd Pref.	5½	—	2½	—	—
do. do. 5 Deb.	5	5	69	—	7 18 10
Brazil Tractions	—	—	13	+⅜	—
Bombay Electric Pref.	6	6	9½	—	6 6 4
British Columbia Elec. Ry. Pfce.	5	5	6½	+1	8 0 0
do. do. Preferred	Nil	Nil	47⅜	+4	Nil
do. do. Deferred	Nil	Nil	40	+5	Nil
do. do. Deb.	4½	4½	60	—	6 15 0
Mexico Trams 5 per cent. Bonds	Nil	Nil	44	+6¼	Nil
do. 6 per cent. Bonds	Nil	Nil	34½	+4½	Nil
Mexican Light Common	Nil	Nil	21	+1	Nil
do. Pref.	Nil	Nil	29	+2½	Nil
do. 1st Bonds	Nil	Nil	44	+6¼	—
Manufacturing Companies.					
Babcock & Wilcox	15	15	88	—	4 9 0
British Aluminium Ord.	10	10	11½	—	5 18 6
British Insulated Ord.	20	20	34	—	5 6 8
British Westinghouse Pref.	7½	7½	24	+ ½	5 14 3
Callenders	20	—	18½	+1	5 16 0
do. 5 Pref.	5	5	4xd	—	6 5 0
Castner-Kellner	22	20	3 7/16	+ ½	5 16 0
Edison-Swan, fully paid	—	—	38	—	Nil
do. do. 4 per cent. Deb.	4	4	75	—	5 6 0
Electric Construction	7½	10	1 3/16	— 1/16	8 8 0
Gen. Elec. Pref.	6	6	10¾	+ ¼	5 15 8
do. Ord.	10	10	23	+1	*4 7 0
Henley	25	25	21½	+ ½	5 17 8
do. 4½ Pref.	4½	4½	8	—	5 12 2
India-Rubber	10	10	16¾	+ ¾	*6 2 1
Telegraph Con.	20	20	42½	—	*5 18 0

*Dividends paid free of Income Tax.

THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

Annual Convention.

The twenty-third annual meeting of the Incorporated Municipal Electrical Association was held at Manchester on Thursday and Friday last week, and was well attended and highly successful. The proceedings were opened in the Town Hall by the Lord Mayor, Sir Alexander Porter, who extended a hearty welcome to the visitors, whom he described as both literally and metaphorically "men of light and leading." He remarked that this was the third time the Association had met at Manchester, the presidents on the previous occasions being Mr. C. H. Wordingham and Mr. S. L. Pearce (both of whom were present at this meeting), and paid a cordial tribute to the merits of Mr. Pearce, the city electrical engineer. Alluding to the fact that the former meetings had taken place in torrents of rain, whereas on this occasion fine weather prevailed, he expressed the hope that the third time would bring luck, but, alas! the weather quickly changed, and there was plenty of rain during the session.

The President, Mr. S. J. Watson (borough electrical engineer, Bury), warmly thanked the Lord Mayor for his cordial reception, and the City Council for the use of the Council Chamber. Mr. Watson then read his presidential address, of which an abstract is given on the next page.

Bailie Willock proposed a vote of thanks to the President for his excellent address, remarking what a glorious debate they could have had on it—if it had been open to debate. Committeemen should use it to check the achievements of their engineers.

Mr. Watson acknowledged the vote of thanks, and called upon Mr. Pearce to open the discussion on "The Future of Electric Power Supply," which occupied the remainder of the sitting, and was adjourned to the following day.

In the afternoon the members visited either the works of the British Westinghouse Co. at Trafford Park or the Stuart Street Power Station of the Manchester Corporation, being conveyed to their respective destinations by special tramcars provided by the Corporation. At the former, the visitors were received by Mr. W. W. Blunt, who, in a brief address of welcome, stated that since 1909 the output of the works had increased threefold, and the number of employés now exceeded 10,000. The financial control of the concern, formerly American, had been transferred to British hands, and it was now entirely owned in England, by English interests. The company would devote its whole efforts to increased efficiency, and hoped that the good relations which now prevailed between manufacturers and customers, greatly assisted by the patience and consideration shown by the latter under trying conditions, would endure.

Amongst the many interesting machines and apparatus in course of construction in the works, we may mention especially a rotary converter for 1,500 kw. at 1,500 volts, a d.c. motor of 7,500 h.p. at 1,000 volts, and a large vertical double-acting gas engine.

At Stuart Street station, which was also open for inspection on Friday, items of special interest were the huge boilers (Babcock & Wilcox marine type, 60,000 lb. per hour), and turbo-alternators of 15,000 and 20,000 kw. The latest of these, a Richardsons, Westgarth turbine and Westinghouse alternator, has been running since May 17th on practically full load without a stop. A 25,000-kw. set of the same build is on order, and will bring the total capacity of the station up to over 100,000 kw., of which over 77,000 kw. has been added since June, 1909. The six cooling towers installed (one on order) during the same period can deal with 4,600,000 gallons of circulating water per hour. The first instalment of the 33,000-volt underground mains, the future standard voltage, is being laid between Manchester and Salford.

At the works of Messrs. W. T. Glover & Co., Ltd., demonstrations were given of the company's new patent test-sheath cable, which we describe elsewhere in this issue.

In the evening there was an excellent smoking concert at the Engineers' Club, to which the members were invited, and as far as practicable they were made free of the facilities of the club.

The discussion on "Electric Power Supply" was opened by Mr. S. L. Pearce, who remarked that the report on Coal Conservation had been dealt with in his address to the Engineers' Club, and had been practically superseded by that of the Board of Trade Committee on Electricity Supply; he gave a critical analysis of the latter, which he regarded as a reasonable compromise, based, to a great extent, on the proposals of the Lancashire and Cheshire Report; and while he found much to criticise, he strongly commended the scheme as a whole to the favourable consideration of the members.

Bailie Smith (Glasgow) one of the signatories to the report, welcomed Mr. Pearce's approving remarks, and emphasised the necessity of prompt action. Mr. S. E. Fedden paid a tribute to Mr. Pearce's illuminating treatment of the two reports, and, while he found fault with many features of the new scheme, expressed general approval of its proposals. The discussion was continued by Councillor Dymond, Mr. C. H. Wordingham—who regarded the report as epoch-making, and of the utmost importance to the industry—Mr. G. Wilkinson, Mr. R. A. Chattock, and Mr. F. W. Purse, and was then adjourned to the following day. On the resumption of the discussion, Councillor Barge, Mr. H. S. Ellis, Mr. J. W. Beauchamp, Alderman Higham, Mr. H. F. Proctor, Alderman F. W. Smith, Mr. R. Lomax, Bailie Willock, Mr. C. Turnbull, Mr. Purse, and Mr. T. D. Clothier took part, and Mr. Pearce briefly replied.

The annual general meeting then took place, and the report of the Council was discussed. Mr. J. W. Spark (West Hartlepool) uttered a strong protest on behalf of the N.E. Coast municipalities against the action of the Council in giving evidence without consultation with the members, and the President explained that the Council had to act on short notice. Mr. C. H. Wordingham strongly supported a proposal of Mr. A. C. Cramb that local centres should be formed, and outlined a scheme for the combination of the I.M.E.A., the B.E.A.M.A., and other bodies representing various sections of the industry, under the Institution of Electrical Engineers. Mr. L. L. Robinson supported the proposal, and Councillor Lindsay, who pointed out that a local Association was being formed in Scotland, in alliance with the I.M.E.A., moved a resolution to the effect that the Council should formulate a constitution for local centres, which Mr. Purse seconded, claiming it as one of his "babies." Ald. Higham suggested that the companies should be admitted, but the proposal was emphatically rejected, and the matter was ultimately referred to the Council. On the subject of salaries, Mr. Robinson drew attention to the disgraceful treatment of engineers by Councils, and moved that the Council should ask the Committee on Production (not Sir George Askwith) whether the award of £1 + 12½ per cent. did, or did not, apply to chief engineers. Councillor Barge seconded, and the resolution was carried unanimously. Mr. Wordingham drew attention to the various organisations in existence, or in course of formation, to represent sections of the industry, and emphasised the importance of unity in this matter; he urged the members to attend the mass meeting that was to be held in a fortnight's time, and to help to form a strong Association that would look after the interests of engineers.

The result of the postal ballot for the new members of Council was as follows:

President: Mr. F. Ayton. Vice-President: Mr. T. Roles. Representatives of Large Stations: Messrs. R. A. Chattock, J. W. Beauchamp, A. S. Blackman, L. L. Robinson. Representatives of Small Stations: Messrs. C. M. Shaw, E. E. Hoadley. Councillors: Bailie Smith Councillor Thompson. Hon. Secretary: Mr. H. Faraday Proctor. Hon. Treasurer: Mr. A. C. Cramb. Hon. Solicitor: Alderman Pearson.

A vote of thanks to Mr. J. E. Edgecombe for his past services as hon. treasurer was recorded, together with similar acknowledgments to the president, the hon. secretary, and other officers.

On the proposal of Mr. C. Furness, it was resolved that a general meeting should be held within six months, at Birmingham, to consider the Board of Trade Bill when drafted to carry out the proposals of the Committee on Electric Power Supply.

The proceedings then terminated.

Presidential Address.

By S. J. WATSON.

(Abstract.)

The Association numbers amongst its members the engineers and municipal committees representing the administration of undertakings having a capital expenditure of over £60,000,000, and an annual income approaching £10,000,000.

The practicability of arranging for members of the Association to form local sections has been considered by the Council on more than one occasion during recent years. Several local associations, consisting usually of the engineers of supply undertakings, have been in existence for some time in London and certain provincial centres, and have carried out useful work by appointing committees to consider and report on such questions as interconnecting supply systems.

Closer co-operation between the Council and members is desirable, and the first step to take is to get into touch with those local organisations of engineers or representatives of undertakings which already exist with a view of forming such organisations into local sections of the I.M.E.A.

The establishment of strong local sections endowed with a large measure of local autonomy, working in conjunction with a Central Federated Council, nominated partly by each local section and partly by unattached members, would ensure a much greater interest in the work carried on, as there would be a closer relationship between the Central Council, the local sections, and members generally than is possible under present conditions.

However we may agree with or differ from the findings of the Coal Conservation Sub-Committee, I believe we all realise that existing methods require overhauling, as the future manufacturing prosperity of the nation must almost, if not entirely, depend on the provision of a cheap and reliable supply of electrical energy.

Supply undertakings have played no small part in the nation's activities during the last three years by enabling manufacturers immensely to increase their output of essential articles and by facilitating the establishment of new factories, and the usefulness of a centralised supply has been more fully demonstrated than might otherwise have been the case. Still greater benefits would have been derived if some of the contemplated extensions to power stations had been carried out during the early part of the war. Through the inability of undertakings to meet all demands many antiquated private plants have been re-started which would otherwise have been scrapped, second-hand inefficient machinery has been brought into use, and in many cases important engineering shops, capable of turning out work of a more vital character, have been engaged on the production of small prime movers. This has led to a waste of fuel, increased transport, and to the additional employment of labour which might have been avoided.

Census returns show that Great Britain, with a population of 45,000,000, employs power to the extent of 10,750,000 H.P., including 2,000,000 H.P. used by public utility undertakings, leaving 8,750,000 H.P. for manufacturing purposes, say an average of approximately 1 H.P. to five inhabitants. In parts of industrial Lancashire the amount far exceeds this figure; in some cases it is as high as 5 H.P. to eight inhabitants. In the area of 400 square miles with Manchester in the centre and a population of 2,600,000, it is safe to take the power requirements at 1 H.P. to two inhabitants, say a total installed capacity of 1,250,000 H.P., or 750,000 KW. Allowing for diversity of usage, this would represent a maximum demand of approximately 450,000 KW.

In this area there are 18 statutory electricity supply undertakings possessing generating stations, and as all of these were in operation prior to 1905 I have ascertained the progress made in the use of the public supply between that year and 1915.

The capital expenditure increased from £4,170,000 to £6,662,000, the plant capacity from 58,750 KW. to 184,850 KW., the maximum load from 38,800 KW. to 111,700 KW., the units sold from 65,250,000 to 260,500,000, the income from £520,000 to £1,095,000, and the working expenses from £240,000 to £595,000.

With an increase of 60 per cent. in the capital expended the plant capacity has been increased by 215 per cent; with an increase of 190 per cent. in the maximum load the output has increased by 300 per cent., the income by 110 per cent., and the working expenses by 148 per cent. It is evident that extensions have cost very much less than the original plant, and that the additional output has been sold at cheap rates effecting a marked improvement in the load factor, and consequently in the cost per unit supplied.

The output for different purposes with the maximum load for 1905 and 1915 was as follows:—

	1905		1915	
	Units sold.	Maximum load.	Units sold.	Maximum load.
Lighting	9,000,000	8,400 KW.	21,000,000	18,200 KW.
Tramways	37,000,000	22,600 KW.	61,000,000	30,000 KW.
Power	19,000,000	7,800 KW.	178,000,000	63,500 KW.
Totals	65,000,000	38,800 KW.	260,000,000	111,700 KW.

The total maximum demand for industrial power in the area is estimated at 450,000 KW. It might therefore be assumed that as the maximum load amounted to 63,500 KW. in 1915, about 14 per cent. of the possible demand was already being given. Closer investigation shows, however, that a very large proportion of the demand for power is due either to extensions of existing works or to the establishment of new industries. In these cases electrical driving has not been substituted for any other form of power, but has enabled extensions to be carried out or new works to be equipped without adding to the numbers of isolated plants.

It has been estimated that the average coal consumption throughout the country is from 5 to 7 lb. per H.P.-hr., and the statement may quite possibly be correct, but I am quite sure it is not true so far as this particular district is concerned.

As electrical driving has already superseded a large proportion of the small private plants, the average size of the remaining plants is comparatively high, and the majority of the engines are of the slow-speed reciprocating type. There are no keener engineers in the country than those responsible for the design and operation of this class of prime mover, and excellent coal consumption figures are obtained. Under these circumstances, the process of obtaining the larger manufacturers as consumers is somewhat slow. It is not until the engines or the boilers require replacing that the question of changing over is seriously considered. There are, however, many instances during the last few years where even the largest concerns, after the most careful investigation, have decided to scrap their own plant and purchase the whole of their requirements from the outside source. An increase of 340 per cent. in the units used for power purposes between the years 1905 and 1915 clearly indicates the growing confidence in electrical power supply.

Assuming an ultimate demand of 450,000 KW. and a load factor of 50 per cent., which is well within the range of probabilities, the total output required for industrial power purposes will amount to 2,000,000,000 units per annum, excluding any supplies to railways or new industries. A further field for the use of the supply lies in the substitution of electrical heating and cooking apparatus for the existing domestic fires. The consumption of coal for this purpose amounts to about three-quarters of a ton per individual per annum, or, say, nearly 2,000,000 tons in this area, all of which is burnt in notoriously inefficient open grates. This quantity of fuel if consumed at a power station would enable upwards of 2,000,000,000 units to be supplied to meet these requirements. Provided a low scale of charges is adopted, and reliable heating appliances are available at a reasonable cost, there seems no reason why this important duty should not be carried out electrically.

After making some provision for railway electrification, the establishment of new industries, and domestic developments, it is not at all improbable that the total electrical requirements will amount to 5,000,000,000 units per annum at the end of the next two decades, with a maximum load approaching 1,000,000 KW.

My sole object in mentioning these figures is to bring home to all our members the importance of the problem awaiting solution in the near future. We have reached an epoch in the history of electricity supply, and if the greatest possible use is to be made of the most important national asset, *i.e.*, coal, it is essential that a long view should be taken of the position.

(To be concluded.)

Electric Power Supply.

Opening the discussion on the report of the Board of Trade Committee, Mr. S. L. PEARCE said the subject was of the greatest importance; the report of the Coal Conservation Committee, which had been superseded by the one under consideration, had been open to objection on the score of its disparagement of the work of local authorities, wholesale condemnation of existing plant, proposed stoppage of extensions at existing stations in favour of the erection of new superstations, and its suggestion that private enterprise was better fitted for the future conduct of the business. Transmission was a most vital factor in any scheme for reorganising the supply industry. Referring to his address before the Engineers' Club,* Mr. Vernier had questioned the accuracy of his figures, mainly on the ground that he had considered only point-to-point transmission, whereas in practice there would be sub-stations on the route of the mains. For point-to-point transmission he had, if anything, under-stated the case; if there were any deviation from that system, the capital cost would obviously be increased, and a large amount of underground cable would be laid, with perhaps a second transformation. He was not sure that a distributing system would show up so well. In general, Mr. Vernier agreed that future generating stations would not be more than 20-25 miles from the load. It was interesting to note that Mr. Vernier pronounced in favour of underground cables, at the highest possible pressure, for main transmission lines, only local lines being overhead. The highest pressure likely to be adopted on overhead lines in this country was 66,000 volts. A good case could be made out for underground cables at high pressure, allowing for the higher depreciation and maintenance of overhead lines. Turning to the report of the Board of Trade Committee, he expressed very great satisfaction with the fact that it was unanimous. The report was of the nature of a compromise; there was no one definite conclusion

* ELEC. REV., March 22nd, 1918.

laid down for the whole country—the report was very flexible. Reviewing the principal recommendations, Mr. Pearce said that one of the most important points was the retention by existing undertakers of full powers of distribution. In contrast with the Coal Conservation report, the principle of public ownership was advocated, the amalgamation of existing interests was preferred to the formation of a new organisation, and the proposals were framed more on the lines of existing conditions; there was no suggestion of the establishment of super-stations and long transmission lines. It was left for the District Boards, under the supervision of the Commissioners, to decide what should be done with regard to the local conditions. The proposals were just to the interests involved, and offered a reasonable solution to the problem; he hoped they would be accepted by municipal engineers. Certainly they would be welcomed by the majority of the engineers who signed the report of the Lancashire and Cheshire Committee,* from which so many of the ideas were adopted in the Committee's report. A case had been established for the organisation of a broad network under unified control. The amalgamation of company and municipal interests was necessary, and the Boards should be small and compact. The proposals in the report were altogether admirable; he hoped that in working out the scheme the largest measure of local autonomy would be given to them. The whole of the Boards should be financed by the State. With regard to distribution, every statutory authority could retain it in its own area, and the provisions in respect of bulk supply offered reasonable safeguards. There must be some cases in which supply would be given to consumers from the high-pressure main transmission lines of the District Boards, which in such cases should pay reasonable compensation to the local authority in respect of the customers concerned. Having pronounced in favour of District Boards, he asked why the Committee admitted the principle of "contracting out," which if applied to local authorities must also be given to companies. The financial terms proposed would fall unfairly on different undertakings, some of which had made adequate provision for the future, while others had distributed their profits in aid of the rates—a proceeding which he was glad to see condemned by the Committee. There was much to criticise in the report, but much that could claim the support of municipal engineers. Now was the psychological moment to secure legislation to solve our problems—if not now, never! He hoped the members would not turn down the proposals on the score of interference with their local autonomy; changes must be made in the national interests, and would affect both large and small undertakings. It was the duty of local authorities to look at the problem as a whole, and give the proposals a fair trial. A large amount of capital would have to be expended, and a considerable period would elapse before the scheme could be carried to completion—therefore they should start at once.

Bailie SMITH (Glasgow), a member of the Committee, was glad to hear how much Mr. Pearce had to say in favour of the report. The conclusions arrived at by the Committee were based on seven months' evidence, not on preconceived opinions, and represented an attempt to be fair to all parties. The I.M.E.A. might feel that some parts might be strengthened, others modified or omitted; but this was the result of give and take between two parties which viewed the problem from opposing points of view. Delay would mean not only loss of money, but a serious handicap to industry—*they must be ready when peace returned.* The principal feature of the report was the unanimous conclusion that the generating stations and main transmission lines should be publicly owned; the local authorities must decide for themselves whether to undertake the distribution or lease it to a company. Flexibility was a strong point of the report; no Committee could tell what exceptions might arise, and the intention was to provide against unforeseen circumstances. Paragraph 55 enabled a large local authority or company to continue supplying in its area, and paragraph 56 met the case of small isolated areas, in which the Commissioners could exercise a dispensing power. No payment would be made for goodwill; this might appear unjust to many concerns, but they must take the whole country into consideration, and they would reap the benefit in low costs. With regard to paragraph 70, relating to compensation for loss of office, the evidence before the Committee showed that the probabilities were all the other way; the increase in the demand would be far beyond what any of them imagined. For example, all urban railways would probably be compulsorily electrified, and the system would very soon be extended to the main lines. There were many other openings, and more men would be wanted, not fewer. The system of rating electrical undertakings was absolutely obsolete, and must be rectified. The erection of super-stations was not contemplated; the District Boards would put up stations where they were required. The report would appeal to their support, and he hoped they would back the Bill of the Board of Trade.

Mr. S. E. FEDDEN (Sheffield) thanked Mr. Pearce for his illuminating commentary on the report, and his splendid criticism of the Coal Conservation report—a fallacious document which should never have been printed. With regard to long-distance transmission, he satisfied himself 16 years ago that it did not pay to go far out of Sheffield; two years ago the question cropped up again, and he investigated the cases of stations 10 to 40 miles away. Comparing a station on an ideal site as regarded coal and water, outside Sheffield, with a station in the city, on the basis of 66 per cent. load factor, 0.8 power factor, 100,000 KW. capacity, he obtained the following figures for the cost of production:—

Distance.	Voltage.	Pence per unit.
1 mile (cooling towers)...	11,000 volts	0·275
10 miles away	33,000 v. underground	0·274
20 ,, ...	,, ,,	0·314
20 ,, ...	30,000 v. overhead ...	0·304
30 ,, ...	40,000 v. ,,	0·331

The main cables of any large scheme should be underground, with overhead lines locally. He concluded that he could put down a power station near the concentrated load, with cooling towers, and supply at 20 per cent. less than from an ideal station 30 or 40 miles away. Stations larger than 100,000 KW. presented difficult problems owing to the immense quantities of water, coal, and ashes to be handled at one spot, as well as the number of outgoing mains. The recommendations of the later report would make for the good of the nation in the long run, but some undertakings would suffer in the meantime; if a large undertaking had to take over a number of small over-capitalised concerns, the cost would be considerably increased for a time. The decision to leave the distribution to the local authorities was welcome. Clause 54 might result in large private consumers getting control and guiding matters in their own interest; the safeguards were totally inadequate. With representation proportional to consumption, some of his consumers would command hundreds of votes, and combinations might be made which would outweigh the local authority. Clause 55 seemed to be framed in the interests of the North-East Coast companies; would a municipality undertake the responsibility of financing an area 20 miles around its borders? The possibility of supplying consumers from the trunk mains needed watching; if his large consumers were taken, he would lose interest in the small ones. The financial proposals were most unfair; they penalised thrift. Those who had husbanded their resources, and those who had reaped kudos by aiding the rates, were treated alike—it was most unfair.

(To be continued.)

* ELEC. REV., August 17th, 24th, and 31st, 1917.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Association of British Electrical Engineers.

In a footnote to the report of the Leeds "mass meeting" in your current issue (page 584), you state that at the Birmingham meeting the resolution was carried and delegates were appointed.

I am, of course, unaware of the nature of the report which you propose printing more fully in your next issue, but should like, on behalf of the E.P.E.A., to amplify the above statement.

Primarily the resolution was carried, after severe criticism, owing to the appeal of the chairman that, inasmuch as there were present engineers who were not members of the E.P.E.A., it was desirable to express approval of the principle of a protective organisation, and, further, that he would be quite agreeable to the passing of further resolutions.

It was then carried unanimously:—"That the proposed Association be constituted in the existing E.P.E.A." Of four delegates elected, two were members of the E.P.E.A., one of whom was the Midland Divisional Secretary.

G. P. Sutton,
Hon. Publicity Secretary.
Electrical Power Engineers' Assn., Midland Section.

Birmingham, *June 22nd*, 1918.

The I.E.E. and E.P.E.A.

As a member keenly interested in the welfare of both these bodies, may I appeal to all qualified electrical engineers to take a less biased path to the ultimate co-ordination of our desires? There do not seem to be many difficulties if we but consider as our object:—"The establishment of an Institution such as would be embodied in a reconstructed I.E.E. acting under a Royal Charter with views and activities such as are represented by the British Medical Association."

It seems to be a *sine qua non* that all qualified electrical engineers would desire to become members of this super-I.E.E. Now there would appear to be two established bodies together covering the whole of this ground, and representative of the industry. These are:—

Academically.—The I.E.E.

Financially, politically, socially, &c.—The E.P.E.A. for the station engineers; the B.E.A.T.A. for the manufacturing engineers.

These two latter Associations are in mutual agreement. Now let the I.E.E. recognise the E.P.E.A. and *vice versa*, as the governing body relative to their different scopes until

such time as the Royal Charter is sanctioned. In the meanwhile, let each carry on its respective duties with, in place of the much-discussed A.B.E.E., a council of members of both associations as a medium through which each can express views, opinions, and even advice. Eventually, with the sanction of the Royal Charter, we could establish a super-A.B.E.E., and the situation would become :—

Royal Charter A.B.E.E.—Power supply and public utility, the E.P.E.A.; academic, the I.E.E.; manufacturing section, the B.E.A.T.A.; which surely covers all needful requirements.

Now to deal with the I.M.E.A. and the A.M.E. (Greater London), I suggest that they cannot become national as the one is sectional, and the other parochial. Nevertheless, they can still carry on their rightful and useful functions, but to them and to the C.T.A.A., in view of the report of the Whitley Committee, I would recommend that their efforts are best confined to academic affairs, leaving industrial questions to the national associations.

In conclusion, a word to individuals :—To I.E.E. members who have not supported the E.P.E.A., the Whitley Report cuts the ground away from under your feet, for a registered union is a necessity, not merely *infra dig.* To E.P.E.A. men who joined not the I.E.E., or who lapsed, and now blame the I.E.E. for its purely academic powers—would not the members of the much-admired British Medical Association have been in a similar position if their rank and file had given their executive the poor support you have accorded the Council of the I.E.E.?

T. Mason.

Ocker Hill, *June 22nd*, 1918.

Telephone Calls.

May I be permitted to make a suggestion through the medium of your journal in regard to telephone work? Suppose one has to ring up 357, for instance. How many times will the switch girl give 397? Very often, I am sure. Just to-day I wanted 75 on a certain exchange and got 79. Now it is not the fault of the switch-girl, nor of the caller; it is the fault of the telephone that it blurrs the already fine difference in sound between the words "nine" and "five"; this needs no scientific proof, as I am sure that everyone reading this letter will corroborate these statements.

Now it would be an extremely simple matter to adopt the following plan :—

1. When the caller wants, say, 79, his words are "seven nine."

2. When he wants 75, he says "seven F." Thus, if he wanted Central 1,205, he would say "One two o F."

The switch-girl would immediately recognise on hearing "F" that 5 was required, even if she were not previously instructed, as I have proved to my satisfaction.

It seems to me that the above presents an extremely simple way out of a well-appreciated difficulty, and if the authorities take it up they will earn the gratitude of subscribers, and find their own system working more smoothly.

Arthur Lawton.

Wolverhampton, *June 20th*, 1918.

[Our correspondent's suggestion appears to be very good. The trouble it is meant to remedy is a familiar and exasperating one.—EDS. ELEC. REV.]

NEW PATENTS APPLIED FOR, 1918.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. SEFTON-JONES, O'DELL AND STEPHENS (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

9,480. "Ignition plugs." A. WATKINS. June 10th.

9,495. "Controlling means for electromagnetic feed-reel brakes." H. V. JAMES. June 10th.

9,525. "Ignition magneto switches for internal-combustion engines." G. MARTIRE. June 10th. (Italy, June 8th, 1917.)

9,562. "Telephone systems." H. M. FRIENDLY. June 11th. (U.S.A., June 11th, 1917.)

9,578. "Manufacture and adjustment of contact plates in Swan lamp bases." H. C. GHIJSEN & NAAMLOOZE VENNOOTSCHAP VITRITE WORKS. June 11th.

9,579. "Appliance for facilitating re-energisation of luminous paint surfaces by means of electric torch." A. B. GIBBONS. June 11th.

9,582. "Incandescent electric lampholders or sockets." B. M. DRAKE. AND DRAKE & GORHAM. June 11th.

9,601. "Regulating device for electric machines." BOSCH AKT. GES. AND O. IMRAY. June 11th.

9,620. "Electro-dynamical devices for purification of waste lubricating oil." F. J. KEAN. June 12th.

9,622. "Electrolytic apparatus." SIR H. ROGERS & C. M. WALTER. June 12th.

9,628. "Electric switches." J. B. TUCKER. June 12th.

9,641. "Heating oils, fats, &c., by electricity for distillation, &c." A. IMBREY & H ALEXANDER. June 12th.

9,651. "Magnetos." A. E. LAMKIN. June 12th.

9,678. "Electric switches." EDISON ACCUMULATORS, LTD., E. W. LEWIS AND J. F. MONNOT. June 12th.

9,735. "Electric switches." BRITISH THOMSON-HOUSTON CO. (General Electric Co., U.S.A.) June 13th.

9,740. "Ignition systems for internal-combustion engines." A. H. MIDGLEY AND C. A. VANDERVELL & Co. June 13th.

9,750. "Electric motor-control systems." BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING CO. June 13th. (U.S.A., June 13th, 1917.)

9,751. "Control of electric motors." BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING CO. June 13th. (U.S.A., June 13th, 1917.)

9,754. "Telephones or microtelephones." R. A. BARON VAN LYNDEN AND NAAMLOOZE VENNOOTSCHAP DE NEDERLANDSCHE THERMO-TELEPHOON MAATSCHAPPIJ. June 13th.

9,773. "Solenoids." E. STIRK, G. STIRK, J. G. STIRK & R. STIRK. June 14th.

9,788. "Sparking plugs." J. E. BARROWS. June 14th.

9,791. "Means for electrically operating reciprocating tools." J. KNIGHT. June 14th.

9,822. "Crucibles for electric furnaces." MORGAN CRUCIBLE CO. & C. W. SPEIRS. June 14th.

9,828. "Vibrating switches or contact breakers for induction coils, &c." H. J. STENNING AND H. W. COX & CO. June 14th.

9,829. "Adjustable contact screws for contact-breakers, &c." H. W. COX AND CO. & H. J. STENNING. June 14th.

9,831. "Electric generators and motors." L. COLLETTE. June 14th.

9,836. "Utilisation of high-frequency oscillations in wireless installations." D. W. BROWN. June 14th.

9,871. "Magneto motor." D. SUCHOSTAWER. June 15th.

9,873. "Inductor magnetos." W. H. NIX. June 15th.

9,887. "Glass bulb cutting machines." GENERAL ELECTRIC CO. & BRITISH THOMSON-HOUSTON CO. June 15th.

9,898. "Electric accumulators." C. L. BREEDEN & H. LUCAS. June 15th.

9,901. "Electric furnace." P. FORSTER. June 15th.

9,905. "Ignition devices for water-cooled explosion motors." A. ISLIKER AND MOTOSACOCHE SOC. ANON. June 15th.

9,906. "Portable electric batteries or cells." G. HARROP. June 15th.

PUBLISHED SPECIFICATIONS.

1917.

1,277. PROCESS FOR THE MANUFACTURE OF THERMO-ELEMENTS HAVING COPPER SULPHIDE AS THE POSITIVE CONSTITUENT. J. Marschall. December 9th, 1915. (103,671.)

4,885. MANUFACTURE OF PLATES FOR ELECTRIC STORAGE BATTERIES. H. Wade (L. H. Flanders). April 4th, 1917. (115,865.)

5,072. ELECTRICALLY-HEATED RESISTANCE FURNACES. H. A. Greaves & H. Etchells. April 11th, 1917. (115,866.)

6,425. COMMUTATING DEVICES FOR INTERNAL-COMBUSTION ENGINES. E. G. A. Churchman. October 24th, 1917. (115,871.)

7,197. VARIABLE ELECTRIC INDUCTANCES. J. S. E. Townsend. May 18th, 1917. (115,876.)

7,262. IGNITION DEVICES FOR INTERNAL-COMBUSTION ENGINES. G. Roesch and C. Talbot, Ltd. May 19th, 1917. (115,881.)

7,337. LOADING COILS FOR TELEPHONE CIRCUITS. British Insulated & Helsby Cables, Ltd., G. E. Bairsto & H. H. Harrison. May 21st, 1917. (115,895.)

7,368. ELECTRIC COUPLINGS. Sopwith Aviation Co. & H. E. Cato. May 22nd, 1917. (115,898.)

7,430. FOUR-STROKE CYCLE EXPLOSION OR INTERNAL-COMBUSTION MOTORS PROVIDED WITH MAGNETO IGNITION APPARATUS. C. A. Hult & O. W. Hult. May 23rd, 1917. (115,901.)

7,461. ELECTRICAL WATER-HEATING APPARATUS. J. F. Barr. May 24th, 1917. (115,904.)

7,510. ELECTRIC FLAT IRONS. C. S. Palmer & D. Palmer. May 24th, 1917. (115,908.)

7,558. DEVICE FOR FORMING ELECTRIC ARCS. Dubilier Electrical Syndicate. August 15th, 1916. (108,851.)

7,562. DEVICES FOR THE LIGHTING, HEATING, AND THE LIKE OF VEHICLES. Maschinenfabrik Oerlikon. May 25th, 1916. (106,826.)

7,900. TELEGRAPH AND LIKE POLES. W. G. Young & F. Downes. June 1st, 1917. (115,916.)

9,080. METHOD OF RECORDING AND REPRODUCING SIMULTANEOUSLY MOVEMENTS AND SOUNDS. H. Pedersen. June 25th, 1917. (115,942.)

9,134. ELECTRICAL SWITCHES. H. W. Cox & J. H. Cowell. June 26th, 1917. (115,943.)

9,153. DEVICES FOR THE SPEEDY FIXING OF FUSE WIRES TO ELECTRICAL INSTALLATIONS. R. A. Kerman & T. Mathias. June 26th, 1917. (115,944.)

9,816. MULTIPOLAR MAGNETOS FOR ELECTRIC IGNITION SYSTEMS. W. J. Mellersh-Jackson (Bosch Magneto Co.). July 6th, 1917. (115,949.)

11,064. CONDUCTIVE CLAMPS FOR ELECTRODES OF ELECTRIC FURNACES. A. Oates. August 1st, 1917. (115,973.)

14,759. ELECTRIC JUNCTION BOXES. F. Moor & Callender's Cable & Construction Co. October 12th, 1917. (116,016.)

17,018. HIGH-TENSION IGNITION MAGNETOS. G. A. Chailliey. June 5th, 1917. (116,032.)

18,281. LIQUID RHEOSTATS. British Westinghouse Electric & Manufacturing Co. December 9th, 1916. (112,434.)

18,796. AUTOMATIC TELEPHONE SYSTEM. Automatic Telephone Manufacturing Co. (Automatic Electric Co., U.S.A.) December 18th, 1917. (116,039.)

19,289. LIGHT DIFFUSERS FOR VEHICLE LAMPS. Steward-Warner Speedometer Corporation. September 22nd, 1917. (116,044.)

1918.

3,705. ILLUMINATION OF GAUGE AND GLASS TUBES. Vickers, Ltd., J. McKechnie & A. H. Robinson. March 2nd, 1918. (116,062.)

4,306. MAGNETOS. G. A. Chailliey. December 29th, 1917. (116,064.)

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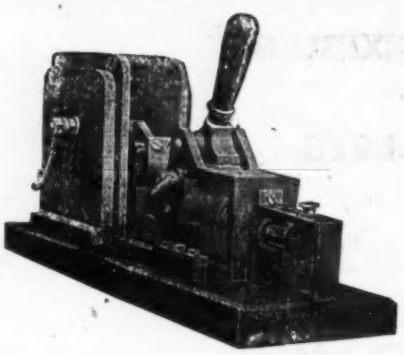

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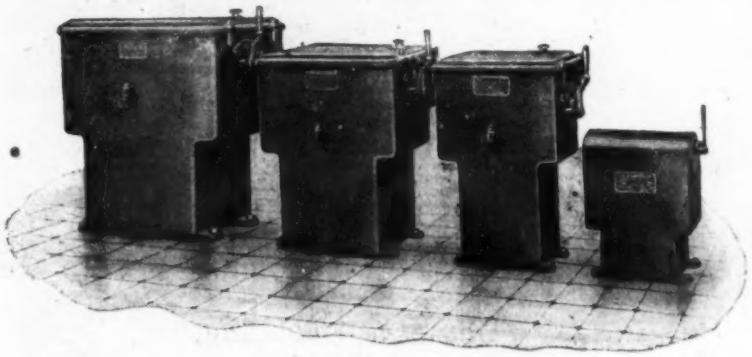

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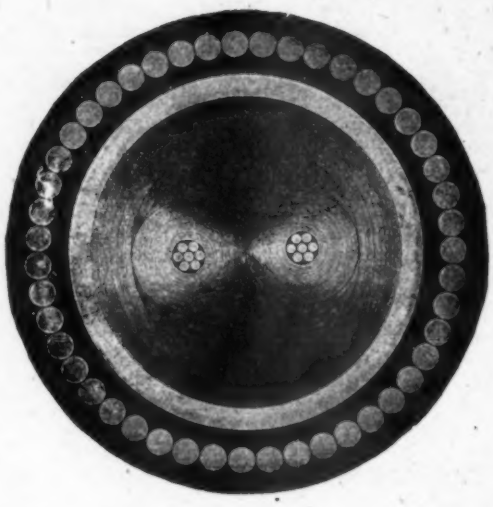

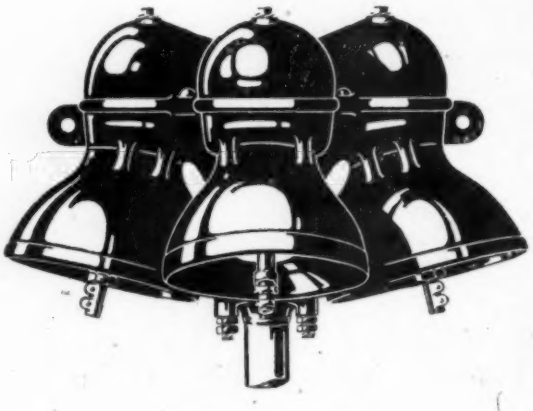

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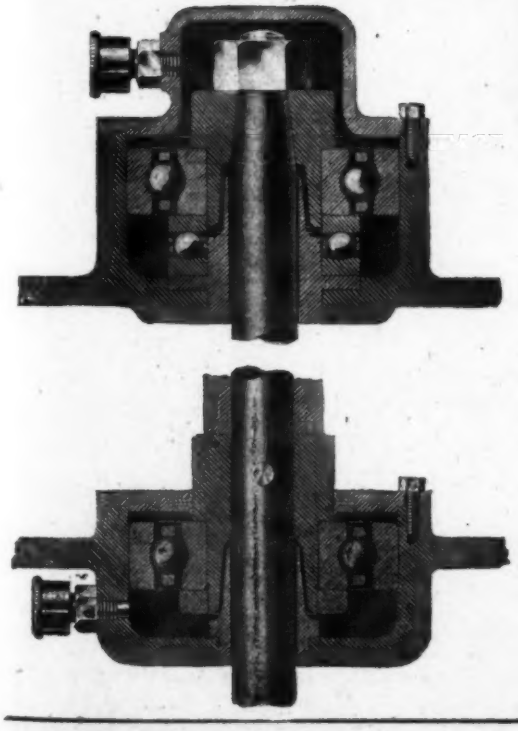

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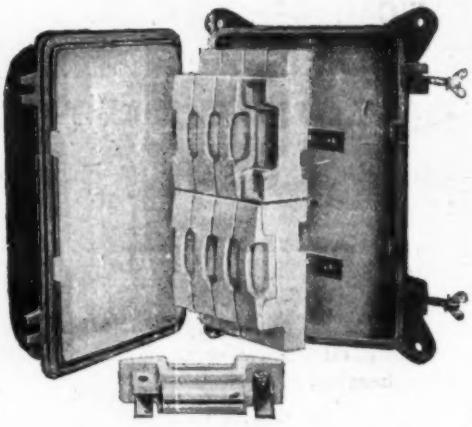

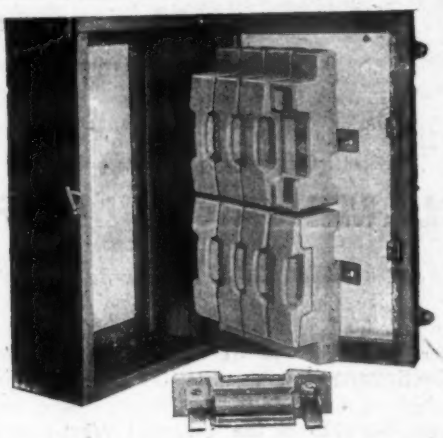

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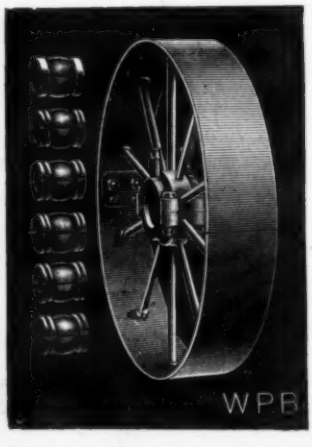

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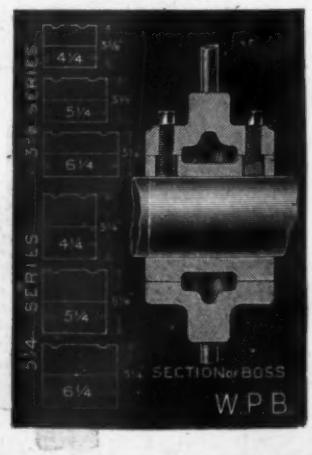

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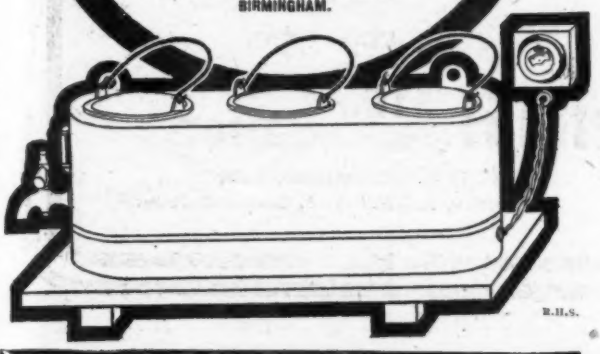

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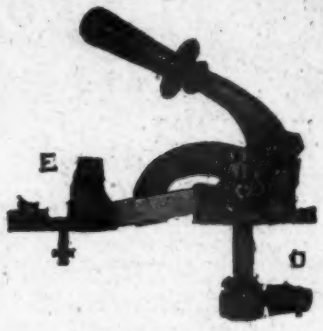

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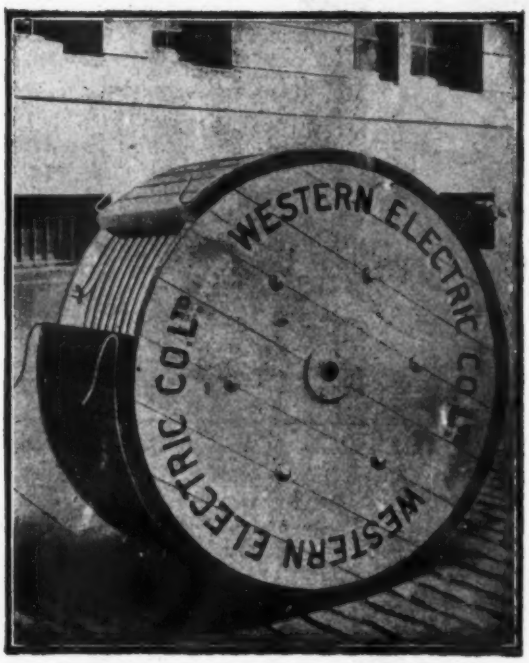

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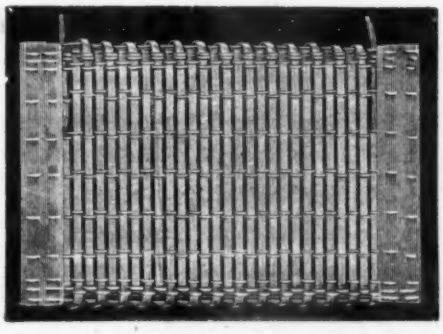
FLAT-RIBBON RESISTANCE GRIDS



All Grids are sent out marked with the number of ohms resistance, and customers can readily arrange them in series or parallel to suit requirements.

The Grids can be supplied with short or long loops for attaching connections for sub-dividing the grids, also for short-circuiting a few of the ribbons to cut out some of the resistance. If the Grids are supplied with long loops, the above ohmic values will be slightly increased.

All Resistance Grids are provided with selvedges or fixing margins at each end (which are entirely free from wires), ranging from 1 in. wide to 2 in. wide, according to the size of Grids, and are of ample strength for assembling the Grids.

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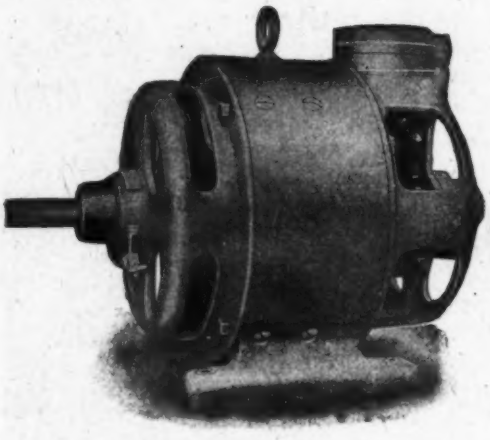
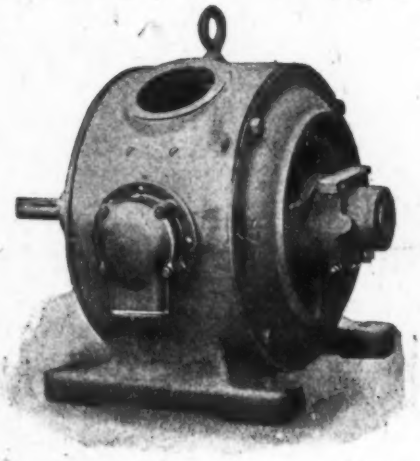


FOR DIRECT CURRENT.



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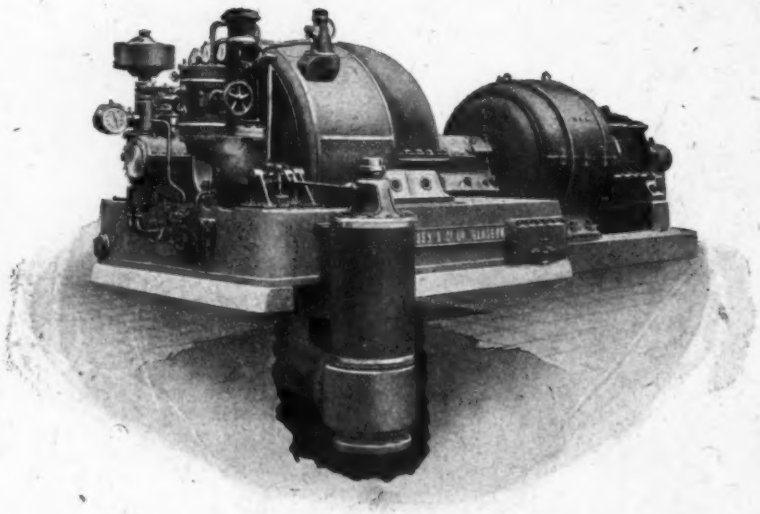

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Installed at NOBEL'S EXPLOSIVES, Ltd., STEVENSTON, N.B.

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Fans for Suction Draught, Ventilating, etc.

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HIGH-SPEED STEAM ENGINES.

BAILEY'S "B.B." TYPE BALL-BEARING GYROMETER

(Speed Indicator).

Fig. 5143.
"B.B." Type Gyrometer.

Designed to give the highest possible efficiency, and embodies all the desirable features which we have found to be necessary in our long experience as manufacturers of this class of instrument for the Admiralty and all the leading engine makers, &c. Beautifully finished in Hard Black Stove Enamel, with Nickel-plated Mountings, and every part manufactured at the Albion Works, Salford.

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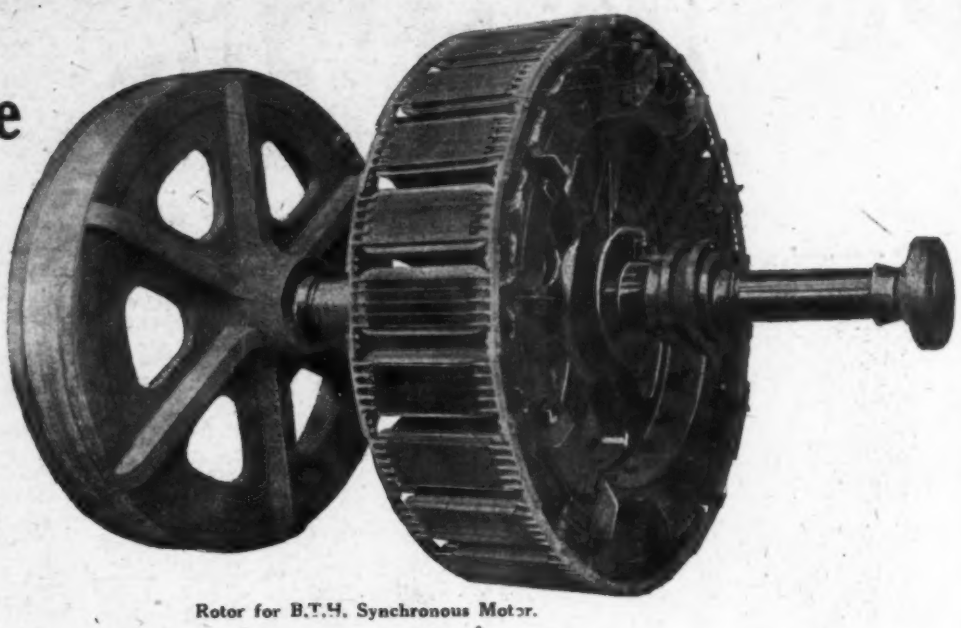
We are Manufacturers of all kinds of Recording Instruments, Pressure Gauges, Steam Pumps, Air Compressors, Valves, &c.

Sir W. H. BAILEY & Co., Ltd., Albion Works, Salford, Manchester.

Improve your power factor.

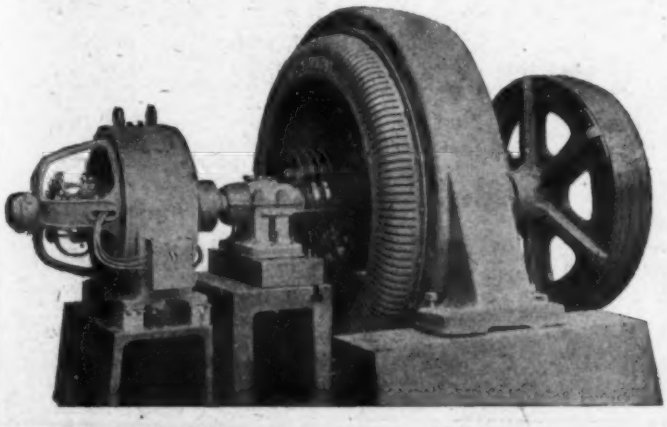


Rotor for B.T.H. Synchronous Motor.

To improve the low power factor generally met with in alternating current installations, due to the induction motors on these systems rarely being loaded to their full rated capacity, synchronous motors capable of running at unity power factor, or even supplying wattless leading current in addition to carrying their mechanical load, should be installed wherever possible.

B.T.H.
Synchronous Motors

enable the power factor to be improved.



The motor illustrated drives a compressor through a friction clutch. Normally 70 per cent. of its K.V.A. rating is used in driving the compressor and 70 per cent. in supplying wattless leading current to the line. It is, however, so designed that it can supply its full K.V.A. at zero leading power factor with a 40 degree temperature rise.

The friction clutch drive allows the motor to be run light as a synchronous condenser on the system when it is not necessary to run the compressor. It is started by means of an auto transformer with a low voltage tapping, the line current at starting being three-quarters of the normal current.

The rotor, for starting purposes, has a squirrel-cage winding on the periphery. To enable any pole to be dismantled without disturbing adjacent ones, each pole is complete with its windings, the end rings being bolted together to form a ring at each end.

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Are the safest in congested Workshops and Factories.

No Gangways necessary, all live metal under locked . . . . cover. . . . .

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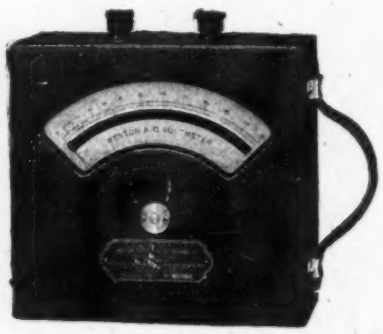
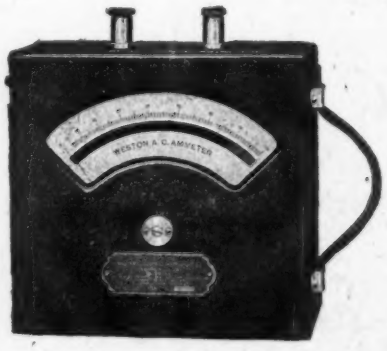


Model 155 Voltmeter. List Price from **£4 5s.**



Model 155 Ammeter. List Price from **£4 0s.**

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Portable A.C. Instruments.

Model 155.

Model 155 Instruments are very compact and light and have excellent scales. The cases are of wood, neatly finished and dust proof.

They have no discernible working error, the indications being the same whether left in circuit for a second or permanently, and they are perfectly dead beat.

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They are also suitable for direct current, and the ammeters may be safely connected in circuits of pressure up to 2,300 volts and are made in ranges up to 500 amperes.

Full particulars of these Instruments are given in our List D 4, which will be sent upon request.

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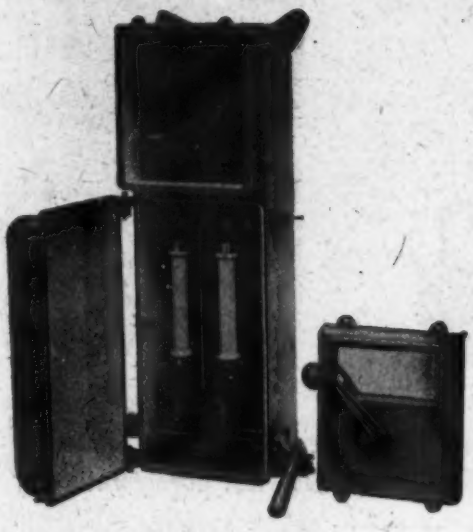
WORKS: ASTON, BIRMINGHAM.



COMBINED SWITCH AND STARTER.

Specially suitable for mounting direct on machine tools, or where space is limited.

Pedestal Ammeters fitted on the top when required.

Fuses can be either Handle Pattern (as shown) or Home Office Bridge Pattern.

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Single- Double- or Triple-Pole . . . . . .

In Teak or Iron Cases .

All Standard Capacities. Voltages up to 500 Volts.

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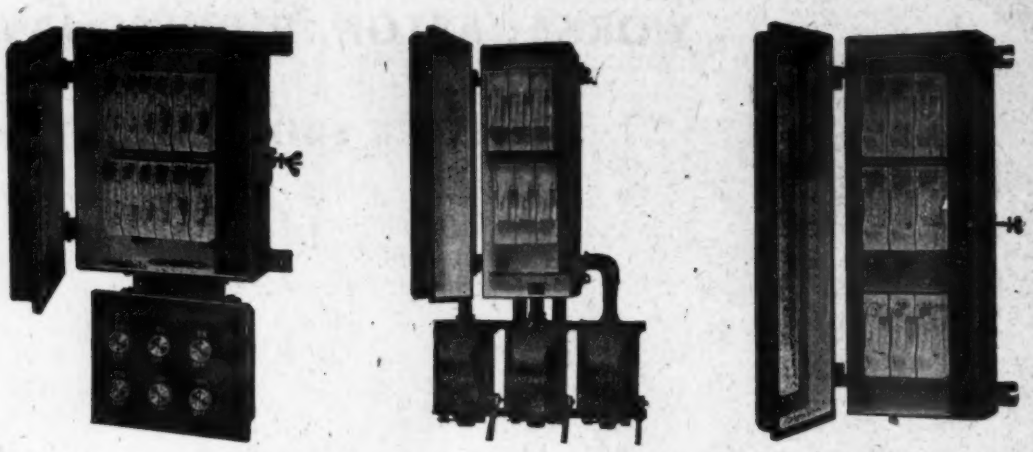

Designs prepared and Estimates submitted for Switch and Fuse Gear suitable for any situation where SAFETY and EFFICIENCY are the first considerations.

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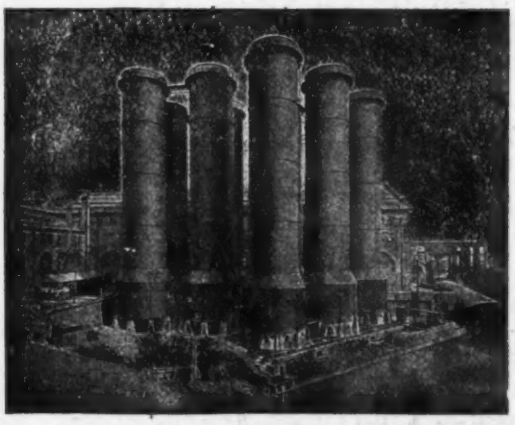
Natural or Forced Draught.



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AS SUPPLIED IN LARGE NUMBERS TO ARSENALS, DOCKYARDS, EXPLOSIVES WORKS, CHEMICAL WORKS, FACTORIES, ETC.

SINGLE POLE 5-AMP. SWITCH.

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Supplied Single or Double-Pole.

This System will commend itself to engineers as an improvement on the practice of mounting a number of switches inside the same box as the fuseboard and in place of straggling single units. The switches are mounted on one iron base, this being usually fitted in proximity to the distributing fuse-box. The switches are foolproof, and saving is effected in cost and labour. The words "ON" and "OFF" are cast on the lid, and the switch handle is of cast gun-metal, giving a substantial yet neat appearance. The boxes can be drilled & screwed to requirements, and there is ample space inside cases for safety and ease in wiring.

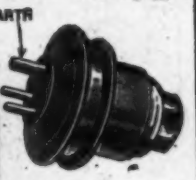
With loose or removable keys, 1/4 per way ex.

NUMBER OF SINGLE POLE 5-AMP. SWITCHES.

1	2	3	4	5	6	7	8	9	10	11	12
5/0	9/4	14/-	18/8	23/4	28/-	32/8	37/4	42/-	46/8	51/4	56/-

Prices for Double-Pole and 10-amp. Switches on application.

"BANQUO" SAFETY INTERLOCKING COMBINED WATERPROOF SWITCH AND 3-PIN PLUG.



(Shows Plug removed.)

The Plug is Gun Metal, fitted with Cord Grip to take Cab Tyre or our Tough Rubber-sheathed Flexible Cord specially manufactured for use with this Plug.

Prices on application.

We would WARN our Friends against Unsatisfactory Imitations of "BANQUO" Switches and Plugs.

DOCK AND FACTORY HEAVY CURRENT WATERTIGHT PLUGS.

As supplied to the War Office, and important Government, Railway and Dock Contracts.

Made in 2 or 3-pin plug type from 10 to 600 amps. capacity.

These plugs are substantially well-made. They are fitted with stout earthing connection, which make connection first and break connection last. A protecting cap is fitted with a chain which prevents the current-carrying parts from exposure when plug is out.

"BANQUO" Power and Heating Switch Plug Set.

Waterproof Pattern.

Combined Double-Pole SWITCH,

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No. A9/20, cap. 5 amps. 28s. ea.
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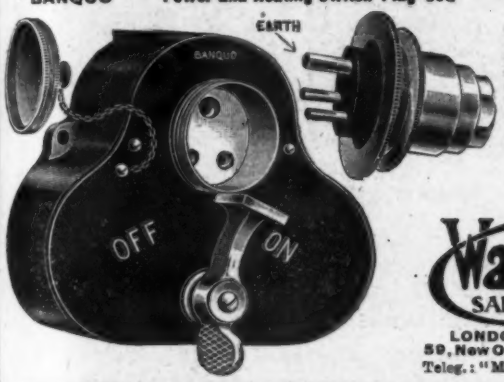

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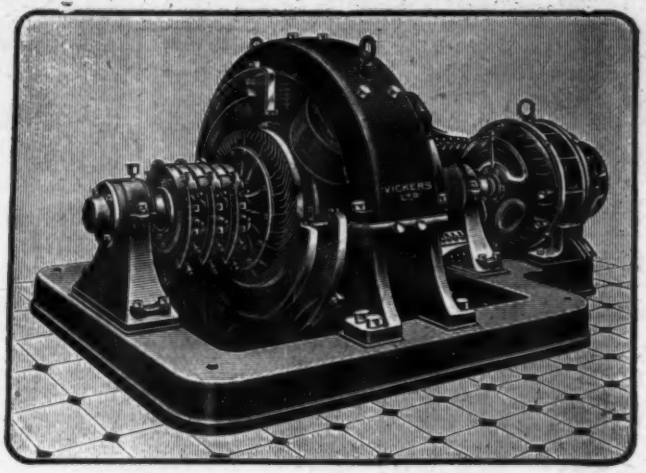

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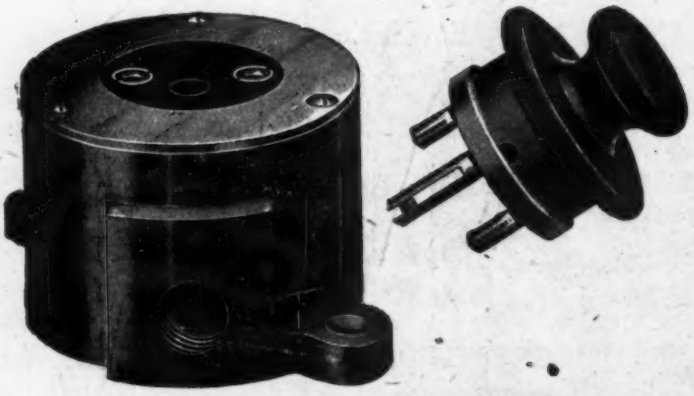

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PORTABLE ELECTRIC TOOLS
FOR ALL PURPOSES.

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PORTABLE DRILLING, REAMING, TUBE EXPANDING AND GRINDING TOOLS.

Wound for all Currents and Voltages.

Designed to withstand the heavy overloads incidental to hard and continuous work without damage.

No. 5. Compensated Side Spindle Drill. Capacity: 2" in STEEL.

PORTABLE ELECTRIC DRILLS,
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Machines for Engineers, Shipbuilders, Iron Founders, Motor Car Builders, Motor Garages, Aeroplane Builders.

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For cleaning the windings of Electrical Machinery and Switchgear.

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as the paste flux that solders even dirty metals without cleaning or corrosion, and joints lead without solder merely by the use of a blow-lamp or blow-pipe. In short, Fluxite

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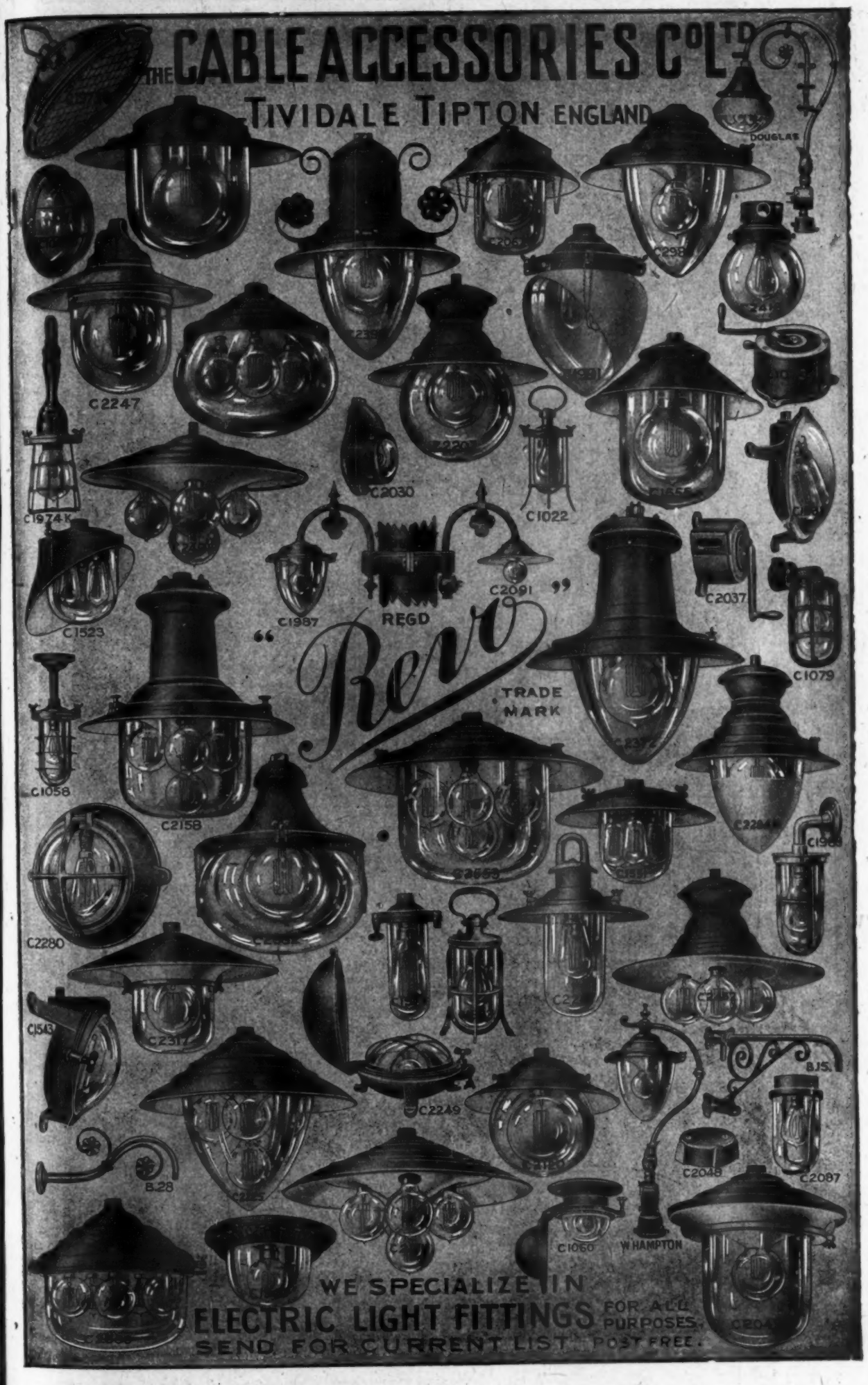
Ask the "Sun" to quote
We hold good stocks of all standard sizes, and can give quick delivery of V.I.R., Lead covered and Cab tyre Cables and Flexible Wires. In all grades. C.M.A. & N.A. manufactured by members of the Cable Makers' Association.
The SUN
ELECTRICAL COMPANY LIMITED
118-120, CHARING CROSS RD.
LONDON, W.C.2.

If it's Electrical, it's better Sun Electrical.


THE CABLE ACCESSORIES Co LTD
TIVIDALE TIPTON ENGLAND
DOUGLAS
C2247
C2030
C1022
C1974K
C1987
REGD
C2091
C2037
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C1079
C1058
C2158
TRADE MARK
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C2249
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B.J.S.
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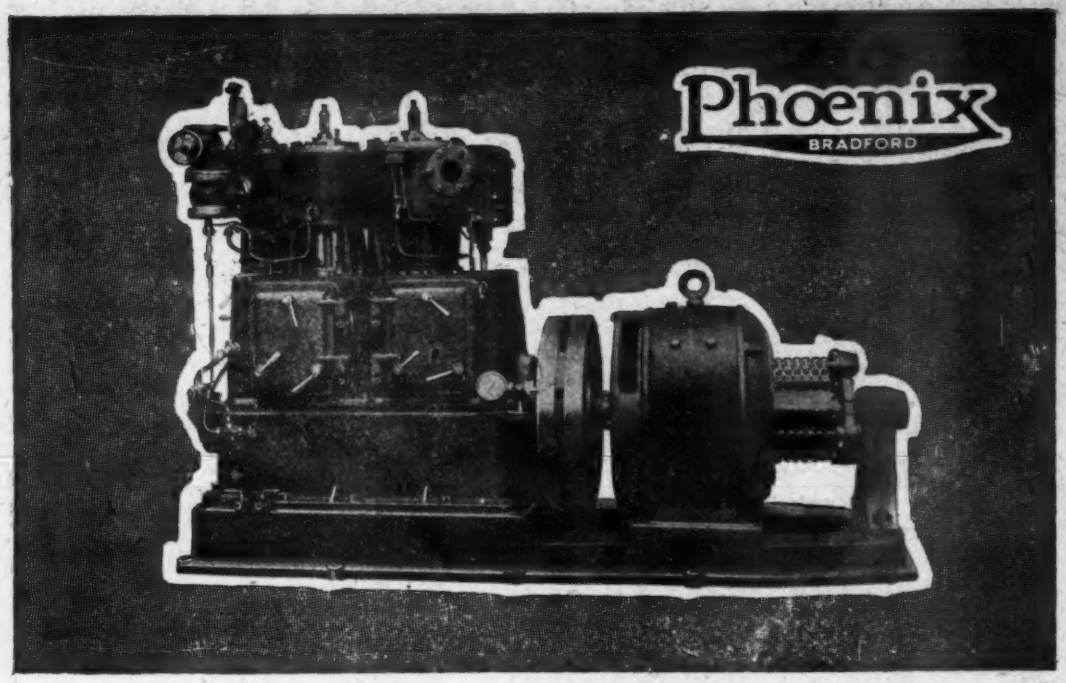
W HAMPTON
WE SPECIALIZE IN
ELECTRIC LIGHT FITTINGS FOR ALL PURPOSES.
SEND FOR CURRENT LIST POST FREE.



Note the worthy features
of
Phoenix Ship Lighting Dynamos.

1. Minimum weight per kilowatt output is obtained by the use of steel carcase and steel fittings where possible and the correct distribution of all active copper and iron.
2. Mica insulation and special impregnation rendering windings impervious to moisture.
3. Perfect balance and absence of all magnetic hum.
4. All parts made to jig and interchangeable. Spare parts of standard sizes stocked.

Phoenix Dynamo Manufacturing Co., Ltd., Bradford.

Phoenix
BRADFORD

Telegrams:
"DYNAMO,
BRADFORD."

Tel. Nos. 3700,
(8 lines),
Private Branch Exchange.

QUALITY FIRST
ASK PHŒNIX TO QUOTE

QUALITY FIRST
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B T-H

MAZDALUX METAL REFLECTORS FOR HALF WATT LAMPS

Ventilated Housing enclosing Improved Lampholder.

Good Lighting.

¶ We are Specialists in Good Lighting.

¶ We design and make Scientific Lighting Appliances and Fittings as well as the Lamps

¶ Lighting Advice and Plans on request.

THESE REFLECTORS—in special sheet steel with vitreous enamel reflecting surface—are the most efficient metal reflectors on the market. They are made in such shapes and sizes as to cover every conceivable lighting condition in workshops, mills, factories, etc.

With them you can solve all Industrial Lighting problems.

SEND FOR OUR NEW LIST No. 10336a.

THE BRITISH THOMSON-HOUSTON Co., Ltd.,

MAZDA HOUSE, 77, UPPER THAMES STREET, LONDON, E.C. 4.

Branches: Manchester, Birmingham, Leeds, Sheffield, Newcastle, Middlesborough, Glasgow, Swansea, Cardiff & Dublin. E 72

Mazda House is the Home of Reliable Wiring Accessories.

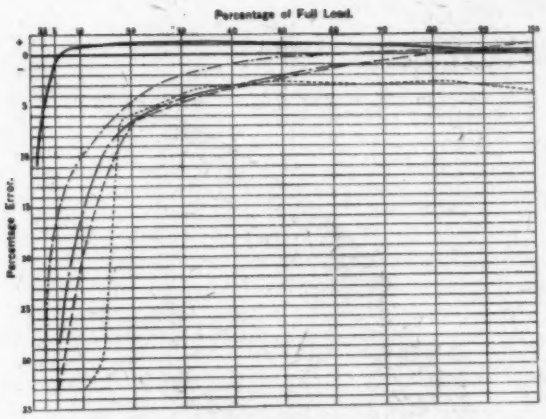
Send us your enquiries for everything electrical you require.

If it's electrical—get it from B T-H

We are Specialists in Good Lighting. We design and make Scientific Lighting Appliances and Fittings as well as the Lamps. Lighting Advice and Plans on request.

F

FERRANTI
C.C. METERS.



The curves show the result of a comprehensive test of five different makes of meters by the Engineer Manager of one of the largest Supply Corporations in Europe.

Ten meters of each make were tested *in situ* **after two years' continuous service** without adjustment or repair of any kind.

The black line curve shows the average of the ten Ferranti Mercury Meters.

All the Ferranti meters were within 1% of their average curve.

The dotted line curves represent other makes (all of the Commutator type).

Note the loss of revenue between 40% load and 5% load.

FERRANTI LIMITED,
HOLLINWOOD, LANCASHIRE.

Telegrams: "Ferranti, Hollinwood." **Telephone: Failsworth 112.**

LANCASHIRE

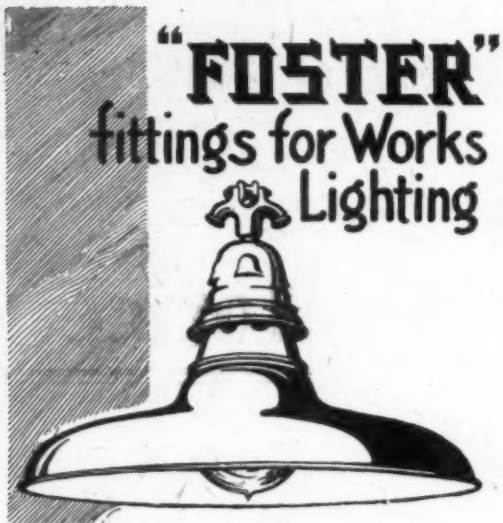
THIS MARK on Electrical Machinery is a guarantee of correct design, good Material and accurate Workmanship.

Motors,
Generators,
Boosters,
Balancers,
Etc., Etc.

THE
LANCASHIRE
Dynamo & Motor Co., Ltd.,
TRAFFORD PARK, MANCHESTER.

Telephones: CITY 7450 (6 lines).
Telegrams and Cables: "IRONCLAD, MANCHESTER."
Le T 10

"FOSTER" fittings for Works Lighting



Large areas lighted without loss.

For shipyards, railway stations, camps, docks and other places of large extent where even illumination is required, there is nothing better than our "extra extensive" reflectors. These confine *all* the light *below* the horizontal and distribute it over a wide area. None is lost in top lighting.

As they are made of porcelain enamelled steel of stout gauge, and are designed to protect the "Half-Watts" they contain from the elements, they are well suited to outdoor use.

Our list shows "Half-Watt" Lamp Fittings for every purpose, so write for a copy to-day.

Foster Engineering Co Ltd
Offices & Works WIMBLEDON LONDON SW

BRANCH OFFICES:
BELFAST, BIRMINGHAM, CARDIFF, NEWCASTLE, GLASGOW, SHEFFIELD, LIVERPOOL, MANCHESTER.

Notice of Removal.

On JUNE 15th we MOVED OUR OFFICES AND WORKS to COMMODIOUS NEW PREMISES at TOTTENHAM.

All communications should be now addressed to

THE BENJAMIN ELECTRIC, Ltd.,

Brantwood Works,

Tariff Road, Northumberland Park,
TOTTENHAM, N. 17.

Telegrams:
"Benjalect," Tottlane, London.

Telephones:
Tottenham 2114, 5 and 6 (3 lines).

The new Works cover a very large area and are admirably situated as regards shipping and transit facilities. The increased area and the improved accommodation as compared with our former premises will, we hope, ensure an accelerated output and every facility for an improved delivery service.

We have endeavoured to maintain our rate of production during the moving operations, and do not anticipate any serious delay in the execution of orders. We solicit, however, the indulgence of our customers for any unavoidable slight delay which may occur.

TELEGRAMS "BENJALECT TOTTLANE LONDON"

BRANTWOOD WORKS TARIFF ROAD,

The BENJAMIN ELECTRIC LIMITED.

NORTHUMBERLAND PARK TOTTENHAM. N. 17.

TELEPHONE TOTTENHAM 2114-5&6 (Three Lines)

THE "ELECTRICAL REVIEW"

CHEAP PREPAID ADVERTISEMENTS

Relating to Situations Vacant, Situations Wanted, Businesses Wanted, Businesses for Sale, Patents for Sale, Specific Articles of any kind Wanted, or for Sale or Exchange, are inserted at the rate of ONE PENNY per Word (minimum 1s.). Box Number and "Electrical Review" Address count as Seven Words.

LATEST TIME FOR RECEIVING 9.30 a.m. THURSDAYS.

Where Advertisements are to be answered to a given Number at the "Electrical Review" Office, applications for Names and Addresses of the Advertisers will be entirely disregarded, and Letters giving incorrect Box Numbers will be destroyed.

*** The Scale does not apply to Trade Advertisements, terms for which can be had on application to 4, Ludgate Hill, London, E.C. 4.

OFFICIAL NOTICES, &c., 1s. per line in Column.

The ELECTRICAL REVIEW is the recognised medium of the Electrical Trades, and has by far the LARGEST CIRCULATION of any Electrical Industrial Paper in Great Britain.

Unless otherwise instructed, **ALL LETTERS** received in answer to Advertisements with a Box number, **ARE FORWARDED NIGHTLY.** Postages incurred are charged at cost.

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Advertisements and replies are only accepted subject to the above conditions.

VALUERS
and AUCTIONEERS of
Electrical Works, Plant and Stock.
WHEATLEY KIRK, PRICE & CO.
(Established 1850).
46, Watling Street, London, E.C.
16, Albert Square, Manchester.
26, Collingwood Street, Newcastle-on-Tyne.

SITUATIONS VACANT.

Latest time for receiving 9.30 a.m. Thursday.

If letters are not to be delivered to certain firms or individuals (if known), instructions to that effect should be sent to the Manager of the ELECTRICAL REVIEW, who will do his best to carry out such instructions. Letters of applicants cannot in such cases be returned to them, nor can the names of Advertisers using a number in any way be disclosed.

Original Testimonials should never be sent.

FAULTSMEN AND INSTALLERS.

WANTED, a number of first-class Telephone Faultsmen and Installers.

Highest rates paid for really competent men. Permanent employment.

No men engaged on Government work, or residing more than 10 miles away, need apply.

Call personally any morning between the hours of 8.30 a.m. and 10.0 a.m.

THE NEW SYSTEM PRIVATE TELEPHONE CO., LTD.,
143/145, Great Portland Street, W. 1. 1883

SITUATIONS VACANT.—*Continued.*

RADCLIFFE URBAN DISTRICT COUNCIL.

Shift Engineer.

SHIFT ENGINEER wanted, with previous experience in Direct-Current, three-wire and Traction Supplies, high-speed direct-coupled Steam Sets. Experience with rotary converter equipment will be a recommendation. Wages £3 5s. plus 12½% per week of 56 hours. Certified undertaking.

Applications giving experience, age, medical grade, to be sent to ENGINEER AND MANAGER, Electricity Works, Lomax Street, Radcliffe, Lancashire. 1937

ENGINEER-IN-CHARGE.

ENGINEER-IN-CHARGE Wanted for Power Station (certified undertaking); must be fully qualified man, with mechanical and electrical (E.H.T.) experience. Salary £182 per annum, inclusive.

Apply stating age, experience, technical training, military service position, &c., to—

1853, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

ENGINEER IN CHARGE.

WANTED, Engineer in Charge of the station of the Ascot District Gas and Electricity Company. Should be experienced with Diesel and gas engines, and with the usual work of a D.C. 3-wire supply station. Commencing salary, inclusive of all bonuses, £220 per annum.

Applications, with copies of three recent testimonials, to be made to A. E. BROOKS, Engineer and Manager, Gas and Electricity Works, Ascot. 4971

ASSISTANT MAINS ENGINEER.

ASSISTANT MAINS ENGINEER required for a large power station in the North. Must have experience in the laying and maintenance of extra-high-tension, 3-phase, low-tension and direct-current cables, also experience in the erection and maintenance of overhead equipment and public lighting.

Apply, stating experience and salary expected, to—

1928, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

CHARGE ENGINEERS.

CHARGE ENGINEERS wanted for Midland Power Station, experienced with turbines, water-tube boilers, and E.H.T. 3-phase. Salary £3 9s. per week, including all bonuses.

Apply, stating experience, age, and enclose copies of testimonials, to— 1933, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

CHIEF ASSISTANT ENGINEER.

CHIEF ASSISTANT ENGINEER required for 3-wire D.C. station (certified undertaking). Must have had experience both in power station and mains work.

Applications, giving full particulars of experience and salary required, to—

1936, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

WAR DEPARTMENT.

Ordnance Depots, Aerodromes, and Military Camps.

THE following positions are now vacant :—

STATION ENGINEERS,
MAINS SUPERINTENDENTS,
FITTER DRIVERS,
FITTERS,
WIREMEN.

Applications, enclosing copies only of testimonials, and stating briefly training, experience, age and wages required, should be sent to the undersigned at once.

Envelopes to be endorsed "ELECTRICAL STAFF."

Applicants of military age must state their classification.

CHIEF ENGINEER,
Southern Command,
12, Wilton Road, Salisbury. 1896

METER SUPERINTENDENT WANTED.

MAN required to take charge of Meter Department, able to test and adjust electric meters, both D.C. and A.C. Must also have had experience in Mains work, and capable of carrying out work as Mains Assistant. Should be technically trained and not less than 28 years of age.

Applications should give full experience and wages required.

1892, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

NORTHAMPTON CORPORATION TRAMWAYS.

Switchboard Attendants.

WANTED, two Switchboard Attendants ineligible for Naval or Military service conversant with D.C. generation for tramways supply ; 54 hours per week. State experience and wages required, with two testimonials before July 6th. to—

JOHN. F. CAMERON,
General Manager.
St. James',
Northampton. 1882

JOINTER-WIREMAN.

REQUIRED Jointer-wireman for work on three-core, paper-insulated, lead-covered and armoured cables, and wiring in conduit and cleat systems. Should be able to plumb joints.

Apply stating age, experience, wages required, with copies of testimonials, to—

D. O. E. L.,
Electric Light Station,
Curragh Camp. 1888

ENGINEERS WANTED.

WANTED, Shift Engineers for combined Lighting, Power and Traction Station. Applicants should have had technical training and be well versed in the running of steam plant generally. Turbine and Alternating Current ; three-phase experience would be a recommendation. Corporation supply ; certified undertaking.

Junior Shift Engineers are also wanted.

Applications in writing, stating wages required and details of experience. Age must not be less than 28 years.

1893 ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

FARNWORTH URBAN DISTRICT COUNCIL.

Electricity Department.

WANTED, Mains Jointer for low-tension three-wire system ; knowledge of D.C. motors and installations a recommendation. Wages 9d. per hour, plus 20s., plus 12½ per cent.

Apply, stating age and previous experience, to—

A. J. HUTCHINSON,
Resident Engineer.
Electricity Works, Albert Road,
Farnworth, near Bolton. 1879

EAST SUSSEX COUNTY ASYLUM, HELLINGLY.

WIREMAN.

GOOD all-round man wanted for maintenance work, lighting (three-wire), motors, telephones, &c. Must be ineligible for the Services and not engaged on Government work.—Apply with references, stating experience, age and wages required, to the RESIDENT ENGINEER AND SURVEYOR, at the Asylum. 1877

SHIFT ENGINEER.

SHIFT Engineer required for Certified Undertaking ; should have alternating current experience. Salary £3 3s. per week inclusive. Full particulars—

BOROUGH ELECTRICAL ENGINEER,
Tunbridge Wells. 1897

SITUATIONS VACANT.—*Continued.*

ADMIRALTY.

Department of Electrical Engineering.

ELECTRICAL ENGINEER required with good experience in general electrical installations in warships.

Apply giving details of experience, stating age, salary required, and forwarding copies of recent testimonials, to the—

DIRECTOR OF ELECTRICAL ENGINEERING,
Admiralty,
Great George Street, London, S.W. 1 1912

TEST ROOM AND METER SUPERINTENDENT.

TEST Room and Meter Superintendent required for a power station in Scotland. Must be able to test, repair and calibrate all types of meters and instruments for alternating current supply, as well as the ordinary direct current instruments and consumers' meters.

Apply, stating experience and salary expected, to—

1927, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

WORKING CHARGE ENGINEER.

CHARGE ENGINEER required for 500-KW., 3-wire D.C. station, B. & W. boilers. Must have had good mechanical experience, and capable of carrying out running repairs. No night shift. Every other Sunday off ; 56-hour week. Accommodation found if necessary. Wages £3 10s. per week, inclusive of all bonus.

Apply, giving full particulars, ELECTRICITY WORKS,
Wellingborough. 1917

CABLE JOINTER.

CABLE JOINTER Wanted for small supply system near Manchester ; must have had experience in paper-insulated lead-covered and armoured Cables for three-phase low-pressure supply. Some knowledge of overhead lines an advantage. State inclusive wage required for 50-hour week.

1925, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

ARMATURE Winder, live man, good prospects. No person resident more than 10 miles away, or already on Government work, will be engaged.—S. WARREN, LTD., 52—54, Theobald's Road, W.C. 1. 4940

ARMATURE Winders, used to repair shop, D.C. work. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply H. D. & S., 32, Newington Causeway, S.E. 1686

ASSISTANT Electrical Engineers required for the Design and Contract Department of large A.C. and D.C. Motor Manufacturers. No person already employed on Government work will be engaged.—Reply, giving full particulars of experience and salary required, to your nearest EMPLOYMENT EXCHANGE, mentioning this paper and No. 1834.

ASSISTANT Engineer for small D.C. station. Must be low category or ineligible. Experience of Diesel engines essential.—Apply with full particulars to 1876, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ASSISTANT required in Order Department of manufacturers of electric lighting accessories, switchgear, &c. Must have some experience in dealing with customers' orders, and the usual routine of an order office. No person already on Government work will be engaged.—Apply, stating full particulars of age, and salary required, to your nearest EMPLOYMENT EXCHANGE, mentioning No. A5518. 1814

CAPABLE Foreman required for estimating and supervising installation work. Government contracts and private house work. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply, giving particulars of experience and salary required, to 4938, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CHARGE Engineer required. Applicants must be competent to carry out repairs on gas and Diesel engines, and have had experience with 3-wire system. Wages 50s. per week, including war bonus. Certified undertaking.—1939, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

COMPETENT Electrician required as working foreman in an electric vehicle garage and battery depôt in London. State fullest particulars of previous experience (which should include D.C. and A.C. machines and accumulators), and wages expected. No person resident more than 10 miles away, or already on Government work, will be engaged.—4888, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

CONTROLLED Establishment desire to engage Draughtsman with experience in mechanical designing of medium-sized Motors and capable of preparing drawings for Switchboards. Position offers ample scope for suitable applicant, in view of important developments after the war. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply with full details of experience, age, &c., to 1908, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN for important War Contracts and post War developments, capable of designing and preparing Drawings for A.C. and D.C. Switchboards and taking responsibility for their execution in the shops. Experience in designing of Ironclad Switchgears an advantage. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply stating full particulars of experience, age and salary required, to 1907, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN required used to detail electrical and tool work. No one already engaged on Government work, or residing more than 10 miles away, need apply.—State age, experience and salary required, to MESSRS. ROTAX MOTOR ACCESSORIES CO., LTD., Willesden, N.W. 10. 1883

DRAUGHTSMAN.—Wanted by electrical switchgear manufacturers in modern works near London, capable Assistant Draughtsman. Diagrams, designs developments under chief engineer, &c. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply, stating experience and salary required, 1887, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN wanted for factory in North London district, one used to electrical switchgear or small mechanical work preferred. No one on Government work, or resident more than 10 miles away, need apply.—Apply, stating salary required, to 1924, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN wanted for switchgear manufacture; serious experience required. Preference given to those who have a knowledge of cost price. No person resident more than 10 miles away, or already on Government work, will be engaged.—Particulars, 1914, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMEN wanted, preferably used to H.T. and L.T. switchboard work. London district. No person resident more than 10 miles away, or already on Government work, will be engaged.—1878, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMEN wanted, used to junction-box and feeder-pillar work, preferably familiar with colliery gear. No one resident more than 10 miles away, or already engaged on Government work, need apply.—JOHNSON & PHILLIPS, LTD., Charlton, S.E. 7. 1932

ELECTRIC Fittings.—Messrs. Waring & Gillow, Ltd., 180, Oxford Street, W. 1, have a vacancy for a Saleswoman. Some previous experience necessary. No person resident more than 10 miles away, or already on Government work, will be engaged.—Write, stating age, former experience and salary, to SECRETARY. 4970

ELECTRICAL Draughtsman. Good all-round man required for new steelworks. Well up in high and low-tension lay-outs, both A.C. and D.C. current. No person already engaged on Government will be employed.—Apply stating age, experience and salary required, to your nearest EMPLOYMENT EXCHANGE, mentioning No. A 5206. 1938

ELECTRICAL Draughtsman required immediately for diagram, lay-out and record work, by controlled establishment with large H.T. and L.T. three-phase A.C. system. Good wages and prospects for suitable man to qualify for permanent post as assistant engineer. No one already on Government work will be engaged.—Apply at your nearest EMPLOYMENT EXCHANGE, mentioning No. A5450. 1736

ELECTRICAL Fitter wanted with Tramway Controller experience.—Write or call, MANAGER, 590, Lea Bridge Road, Leyton, E. 10. 1776

ELECTRICAL Fitter wanted with Tramway Motor experience.—Write or call MANAGER, 590, Lea Bridge Road, Leyton, E. 10. 1777

ENGINEER for country estate; oil engines, water turbines, dynamos, pumping and water softening. Man must be ineligible for military service and not employed on Government work.—State experience and wages required to 4966, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

EXPERIENCED Foreman or Forewoman required to take charge of flashing and mounting department, carbon filaments. No person resident more than 10 miles away, or already on Government work, will be engaged.—9728, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

EXPERIENCED Traffic Clerk required to take charge of office.—THE BRITISH AUTOMOBILE TRACTION CO., LIMITED, 113, Caversham Road, Reading. 1895

FITTER wanted, general repairs; 1s. 3d. + 12½%. Permanency for good man.—Apply MANAGER, Electric Power Station, Brimsdown, N. 4957

SITUATIONS VACANT.—*Continued.*

GARDENER-Electrician, married, over 51 or ineligible, for medium country house; two oil engines (pumping, electric light), and assist in garden; nice cottage (three bedrooms), and garden. State age, experience, family, wages.—MR. GORDON, Hildenborough, Kent. 4922

GOOD Draughtsmen wanted, experienced in Power Station details. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply stating age, experience, salary required and when available, to PREECE, CARDEW, SNELL & RIDER, 8, Queen Anne's Gate, Westminster, S.W. 1. 1909

IMPROVER required, to train for Switchboard Attendant in a Northern County, 3-wire steam driven supply station.—Apply stating age, salary required and full particulars, &c., to 1842, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

LEAD Burner wanted for portable battery work, repairs, &c. North London district. No one on Government work need apply.—Write, stating age, experience and wages required, to 4986, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MAN wanted with knowledge of electric lamp manufacture, small works in N.W. London. No person resident more than 10 miles away, or already on Government work, will be engaged.—4886, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MANAGER (Electrical) for large wholesale firm in Scotland, for duration of War only. Must have a thorough practical and technical knowledge of the trade, and be conversant with all Admiralty and War Office requirements; first-class commercial experience and exempt from military service; salary £300 to £350.—Address, with full particulars, 1926, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MANAGER wanted for Wholesale London Electric Company. Permanency. No person resident more than 10 miles away, or already on Government work, will be engaged.—1871, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MANAGER wanted to control Armature Winding Repair Department; must be an expert both in theory and practice. No person resident more than 10 miles away, or already on Government work, will be engaged.—Reply stating experience, qualifications and salary required, to 1835, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PLUMBER-Jointer required at once; permanency for suitable man; wages 11d. per hour, plus 15s. 6d. per week war bonus, plus 12½ per cent. on earnings; good housing accommodation.—State age and full experience to the ENGINEER, Electricity Works, Redditch. 1920

QUALIFIED Wireman or Electrical Fitter required for general maintenance of lighting and power installation in London district. Ineligible. Permanency. 70s., including bonus. 54 hours.—State age and experience, 1866, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

RELIEF Shift Engineer required for Certified Undertaking engaged on munitions work. Experience of Babcock and Wilcox boilers, turbo-generators and E.H.T. three-phase supply essential. Salary 45s. per week, plus war bonus of 12s. per week, plus 12½ per cent.—Apply, with full particulars of experience, age, &c., to KENT ELECTRIC POWER CO., Railway Street, Chatham. 1830

SHIFT Engineer wanted (certified undertaking). Experience of A.C. and D.C. operation essential. Age over 26 preferred.—Applications, giving full particulars and wages required, to be sent to the ENGINEER, Electricity Works, Dartford, Kent. 4972

SHIFT Engineer wanted for Three-Wire Supply, with batteries. No night work; every other Sunday off; 56-hour week.—State wages required and give brief particulars of past experience, ELECTRICITY WORKS, Wellingborough. 1918

SHORTHAND-Typist wanted, experienced, used to electrical trade if possible. No person resident more than 10 miles away, or already on Government work, will be engaged.—Written application, 8, Lambeth Hill, E.C. 4. 4900

STOKER wanted to take charge of one Single-Drum B. & W. Boiler. Wages 50s. per week, inclusive of all bonus. No night work; every other Sunday off; 56-hour week.—Apply, giving particulars of experience, to ELECTRICITY WORKS, Wellingborough. 1916

STOREKEEPER required by Electrical Contractor, London, W. Knowledge of electrical accessories essential. Ineligible. State age, experience and wages wanted. No person resident more than 10 miles away, or already engaged on Government work, will be engaged.—4962, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

STOREKEEPER required for City wholesale house, with experience of lighting accessories, discharged soldier or man ineligible for the Army. No person resident more than 10 miles away, or already on Government work, will be engaged.—1921, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

SUB-STATION Attendant required, with experience of rotaries and H.T. three-phase system; ineligible, permanency. 6s. 6d. per eight-hour shift, plus war bonus, 20s., and 12½ per cent. weekly. —1864, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SWITCHBOARD Attendant, wanted for a 3-wire D.C. generating station in the North.—Give particulars of experience, wage required, and copies of testimonials, to 1841, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SWITCHBOARD Attendant wanted, West-Coast, D.C., three-wire and tramways. Possible advancement to shift engineer. Wages £3 7s. 6d. per week.—Write experience and copy of testimonials, 1928, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SWITCHBOARD Attendants required for three-phase station, North-East Coast district. Must be ineligible for army service. 84 hours per week.—1781, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TECHNICAL Assistant Engineer required, conversant with the manufacture of A.C. and D.C. motor control gear. No person on Government work, or living more than 10 miles away, engaged. —Apply stating age, experience and salary asked, to ELECTRICAL APPARATUS CO., LTD., Vauxhall Works, South Lambeth Road, S.W. 8. 4958

TURBINE Mechanic.—Wanted a first-class Turbine Mechanic for the shift operation of a large turbine-driven alternating current plant, near Willesden. Must have served a regular apprenticeship. Ineligible for His Majesty's Forces. Permanency for reliable man. 78s. 9d., including bonus. 56 hours.—State age and experience, 1867, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED.—An Electrical Manufacturing Firm in the Midlands requires an Assistant with a knowledge of D.C. machine design. State experience, age, and salary required. Nobody on Government work will be engaged.—Apply to your nearest EMPLOYMENT EXCHANGE, mentioning this paper and No. A5525. 1818

WANTED, by a firm in the S.E. district engaged on munition work, first-class Telegraph Mechanics. No person resident more than 10 miles away, or already engaged on Government work, will be engaged.—State age and experience to 6125, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED by contract department, Assistant Engineer with electrical and steam engine training. Applicant should possess sound commercial experience, and be able to deal with turbo-generator contracts. State particulars of age, experience, and salary required. No person already on Government work will be engaged.—Apply your nearest EMPLOYMENT EXCHANGE, mentioning No. A5506. 1811

WANTED, Fitter Driver for gas driven power station, A.C. and D.C., preferably with experience of multi-cylinder, vertical and horizontal type gas engines. Apply with testimonials, stating age, medical category, and wages required, to 1833, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Instrument Makers, Turners and Fitters, for experimental work near Glasgow. Admiralty controlled. Board and lodgings provided. State fully past experience, wages required. No person at present employed on Government work will be engaged.—Apply your nearest EMPLOYMENT EXCHANGE, mentioning No. A5565. 4956

WANTED, Junior Assistant in electricity works near Glasgow; experience with meter testing an advantage. — Apply stating age, qualifications and wages expected, with references, to 1784, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, on staff of a large textile firm, a well-qualified Electrical Engineer, with good technical training, experienced in designing lay-outs, testing, inspecting, &c. One with some experience of power house working, and who could take temporary charge of same in case of emergency, preferred.—Reply, stating fullest particulars as to experience, age and salary expected. Must be ineligible for military service.—1862, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Switchboard Attendant to take charge of 2,000-volt A.C. switchboard, and superintend running. 56 hours per per week. Good wages to suitable man.—Apply, RESIDENT ENGINEER, Electricity Works, Chelmsford. 1911

WANTED, Turbine Driver for two 1,500-KW. Zoelly turbines. Ineligible.—ABERTHAW CEMENT WORKS, Aberthaw. 1880

WIREMAN with practical knowledge of Electric Lighting, Motor and Telephone work. No person resident more than 10 miles away, or already on Government work, will be engaged. —Call, NEALE & FREUND, LTD., 31, Budge Row, E.C. 4. 1910

WORKS Manager wanted for switchgear manufacture; must be able to take charge entirely of new works. Serious advantages. No person resident more than 10 miles away, or already on Government work, will be engaged. —Write, with references, 1913, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS WANTED.

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A FIRST-Class Electrician. Screwed conduit, casing. Take charge.—4981, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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AN experienced working Foreman requires situation. Conduit installations, also maintenance lighting, heating and power plants. Good references.—4967, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AS Foreman-Manager or Assistant to Contractor, Electrician-Engineer seeks responsible berth as above. Thorough experience erecting complete power and lighting plants for factories; also large country-house plants. Manage men, interview, and knowledge of estimating. Lowest category, protection. Good references.—4901, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ASSISTANT Working Electrician, experienced wiring, lighting, bells, 'phones, dynamos, motors (D.C.), accumulators, oil engines. Age 29. Permanently discharged.—4950, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer, fully competent all branches, 16 years' electrical surveyor, requires permanent position. Government work preferred. Salary £350, advancing £25 yearly.—4952, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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ELECTRICAL Engineer seeks berth with good firm as inspector superviser of foreman's job. Wide experience. First-class references.—4951, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer, thoroughly qualified, desires charge of Works Plant, or other responsible permanent position. Salary £260 to £300. Discharged active service.—4927, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer, with four years' University training and nine years' varied practical experience in the manufacture and design of A.C. and D.C. machines, desires change to suitable position of responsibility. Good references. Replies in confidence to 4887, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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ELECTRICAL Mechanic, accustomed to installation repair and general upkeep, A.C., D.C., high and low-tension plant and general equipment; disengaged.—W. SWINDEN, 41, Rothschild Road, Chiswick Park, W. 4. 4980

ELECTRICIAN, competent, foreman, estimating, interviewing, supervising; all systems. Can take complete charge.—B.G., 24, Park Parade, Harlesden, N.W. 4912

ELECTRICIAN, ex-Naval man requires situation, all round.—H. S., 85, Lathrop Street, Queen's Park Estate, W. 10. 4911

ELECTRICIAN requires situation near London. Government work only.—E. W., 164, High Road, Willesden Green, N.W. 10. 4920

ELECTRICIAN seeks berth, national importance. Competent. Any system of wiring and maintenance.—4973, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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ELECTRICIAN, Wireman; good; experienced all branches. Ineligible.—4983, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN-Fitter, 9 years' experience, seeks Government work.—"ELECTRICIAN," 41, Oscar Street, Deptford, S.E. 8. 4899

FOREMAN Electrician, competent all-round engineer. — T., 37, Argyle Street, E. 11. 4782

INSTRUMENT Maker, first-class experience. Telegraph, mechanical, repetition, and experimental, desires progressive position with after-war prospects, where ability is necessary and appreciated. Refs.—4926, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(Continued on next page.)

SITUATIONS WANTED.—*Continued.*

MANAGER or Foreman; many years' good practical experience, plant, power, lighting, heating, general estimating, erection and maintenance, house and factory, wiring, &c.—4959, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PLUMBER-Jointer (Telephone), with thorough knowledge of testing. Would consider power and lighting. Willing to travel. Ineligible.—WILSON, 65, Lea Road, Sparkhill, Birmingham. 4942

WIREMAN, good, all branches, anywhere.—G., 133, Lupus Street, S.W. 1. 4963

WIREMAN wants work, all systems. Government work only.—W., 36, Parkfield Road, Willesden Green. 4965

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AGENT required to offer insulating and synthetic varnishes, also compounds, &c., to the electrical trade. State terms and full particulars. Commission paid on any trade introduced.—4879, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AN important London firm of merchants with special electrical department wishes to represent in Italy, France, Switzerland, and Spain, firms manufacturing electrical porcelain insulators and fittings, also electrical lamps and/or other articles for electrical industry.—Write, giving full particulars, stating terms, to 4882, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

LOCAL Agents wanted in every town to collect old Electric Lamps on Commission.—Write, 104, Craven Park, London, N.W. 10. 4932

FOR SALE.

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Immediate Delivery.

DIRECT CURRENT.

Quantity.	H.P.	Volts.	Speed.
2	10	440	1200
2	11	220	800
2	11	440	800
1	15	440	1125
1	15	440	800
3	21	220	800
1	21	440	800
1	30	500	800
1	30	220	700
1	30	440	700
1	35	500	750
1	43	440	900
1	50	500	750
1	50	440	800
1	60	500	650
1	105	220	420
1	105	230	550
1	130	440	535

THREE-PHASE, 50 PERIODS.

2	7½	500	720
1	10	500	960
1	15	500	960
1	25	500	960
1	30	550	960
6	50	440	570
1	60	500	720
1	75	440	485
2	288	3000	485

Full specification and prices on application.

THE PHŒNIX ELECTRICAL CO.,
32—36, Broomielaw, Glasgow. 1796

CABLES.

CABLE. Three miles of each 19/14, 19/16, 7/14, 7/22, 3/20, 3/22, 1/18. Guaranteed quality. Best British manufacture.

"ROBUST MACHINERY,"
62, Bradford Street,
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SMALL Motors and up to 300 H.P. rewound and repaired.

Estimates free. 171, Edgware Road,
'Phone: "5173 Padd." W. 2. 4697

FOR SALE.—*Continued.*

FOR SALE.

ONE Automatic Horizontal Condensing Engine, Automatic Expansion, by Ruston, Proctor & Co., with cyl. 14" by 28" stroke.

Two Cross-Compound Hori. Engines, by Robey & Co., with 8¼" and 14¼" cyls., by 16" stroke.

Two Automatic Comp. Hori. Engines, by Marshall, Sons and Co., with cyls. 9" and 14" diam., by 16" stroke.

Automatic Hori. Engine, by Robey & Co., with cyl. 20" diam. by 2' 6" stroke.

Automatic Hori. Engine, by Robey & Co., with cyl. 17" by 33" stroke.

Hori. Boring & Facing Machine, by Noble & Lund, T slotted table, 2' by 2' 2".

Duplex Hori. Boring Machine by Messrs. Butler & Co., two upright standards carrying boring saddle with 3½" diam. spindle.

12" Centres Capstan Lathe on 5' bed by Messrs. Bradbury and Co., Ltd., Oldham, with 2" hole in spindle.

Cutting Off Machine, by Carter & Wright, take bars 5" diam.

Motor-Driven Face Milling Machine by Hetherington and Co., facing head 18" diam.

CATALOGUE of Stock MACHINERY. 2-3000 LOTS.
Free on Application. Inspection invited.

THOS. W. WARD, LTD., ALBION WORKS,
Tel.: "Forward, Sheffield." SHEFFIELD.

R. H. LONGBOTHAM & CO., LTD., WAKEFIELD,

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Tel: { 44 Wakefield. / 867 Newcastle. } Telegrams: "Engineer, Wakefield."

FOR SALE.

ONE Parsons Steam Turbo Set, 3500 KW., 1200 R.P.M., with alternator field-rotating type and exciter complete; 6000-volt maximum load, 40 cycles.

One ditto, 1500 KW., 2-phase, 2000 volts, 50 periods.

One Willans-Parsons Steam Turbo Set, 1200 KW., with Alternator, 1200 R.P.M., 200 lbs. to sq. in., 11,000 volts, three-phase, complete with exciter, also condensing plant, air, and circulating water pumps, &c.

One Parsons Turbo-Alternator, 300 KW., two-phase, 2000 volts, 50 periods.

One 225-KW. Generating Set, engine tandem comp. type, 300 H.P., with Corliss Valve Gear, &c., B.T.H. Generator, 500 volts, compound wound. 5277

MISCELLANEOUS PLANT FOR SALE.

ONE Boby-Chevalet Heater, for dealing with 2,000 gallons water per hour.
Two high-pressure Tubular Water-Heaters.
All Steam Pipes (suitable for 160 lbs. working pressure), Exhaust Pipes, Drains and reserve Water Tank; some Copper.
Waygood's sunk Weighing Machine, 5 tons.
Clarke-Chapman's double-acting Steam Pump.
Overhead Travelling Crane.

1931, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

MERCURY-VAPOUR LAMP.

MERCURY-Vapour Twin Lamp on stand, complete with resistance, reflector and tubes; 100-120 V., D.C.

"ROBUST MACHINERY,"
62, Bradford Street,
Walsall. 1606

FOR SALE.

500/600-volt, 3-phase, 50-cycle, 60/70-KW. Alternator; immediate delivery.
440-volt, 3-phase, 25-cycle, 480-R.P.M., 15-B.H.P., Westinghouse Motor and Starter, £74; 400-volt, 10-B.H.P., 720-R.P.M. ditto, £47.
Address—1757, ELECTRICAL REVIEW,
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PLANT FOR SALE.

ONE Belliss-J. & P. Set, speed 375 revs. per min., voltage 2850/3000, periodicity 50, output 125 K.V.A., provided with separate exciter on end of shaft. In perfect running condition.

1915, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

(*Continued on next page.*)

FOR SALE.—*Continued.*

POWER PLANT FOR SALE.

22-B.H.P. Wheatley Oil Engine, tube ignition, excellent condition; 14-KW. Electromotors Generator, 150 volts, 95 amperes, 1,000 R.P.M.

Switchboard, black polished slate, mounted on angle-iron frame, with voltmeter, ammeter, main machine switch, fuses, three distributor switches, charge and discharge battery switch, cut-outs, regulators, and throw-over switch. Reason for disposal, larger plant now installed. The whole installation complete may be seen running by appointment. Price £285.

Applications to E. BEVAN THOMAS,
Caurau & District Electric Supply Co.,
Caurau, Maestag,
South Wales. 1923

MACHINERY FOR SALE.

SULZER Horizontal Three Stage Mining Pump, 1,500 G.P.M. on 660′ vertical head, 11″ suction, 11″ discharge. Phosphor Bronze Impellers, coupled direct to 500-H.P. motor, three-phase, 500 volts. 50 periods. British Thomson-Houston Co. Westinghouse Mining Type starter, equal to new. Pump and motor will be sold separate if desired, immediate delivery.

Siemens and Halske Direct-current Motor, two-pole type, 130 volts, 200 amps., 950 R.P.M., splendid condition.

THOS. OXLEY, LTD., Shiloh Works, Sheffield.
Telephone: 4630 (3 lines). Telegrams: "Ironical." 1884

MOTORS.

MOTORS, 1, 2, 4, 5, 15, 20, 25, 35-H.P., 220-volt, D.C.; 4, 5, 10, 15, 20 H.P., 440-volt, D.C.; 5, 8, 10, 15, 20, 25, 35 H.P., 2-phase and 3-phase 200-V. and 400-V. Starters and Automatic A.C. Gears for both A.C. and D.C.

"ROBUST MACHINERY,"
62, Bradford Street, Walsall. 1602

FOR SALE.

FROM stock, 10,000 Carbon and filament lamps, motors 200 to 500 volts continuous; dynamo 150 volts, 45 amps.

4931, ELECTRICAL REVIEW,
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Melting Points, 118/120, 121/3.

QUOTATIONS with pleasure immediately upon hearing. Kindly state quantity required. Forwarding instructions have our best attention. We specialise in the supply of paraffin wax to the electrical trades.—NEWMAN & MCKAY, 56, City Road, E.C. 1.

Bankers: London & Provincial Bank, Ltd. 4939

SHUNT MOTOR AND STARTERS.

20-H.P. D.C. Shunt Motor, 110 V., slow speed. Double Automatic Starters, 2, 5, 10, 15, 20, 25 H.P., 220 V. and 440 V.

"ROBUST MACHINERY,"
62, Bradford Street,
Walsall. 1604

PLANT FOR SALE.

ONE Ferranti 2-phase Cellular Switchboard, complete with all instruments for working and controlling the alternators, including exciter, rheostats, ammeters, &c.

The switchboard is provided with duplicate bus-bars, and also with five panels for two-phase feeders.

1930, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

MOTORS AND FANS.

ONE ½-H.P., one 1½-H.P., one 2-H.P., 230-volt Motors.
One 10″, one 14″, one 16″ Desk Fans, 240 volts.

1898, ELECTRICAL REVIEW,
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MACHINES always available for Sale or hire.
ARMATURES and FIELD COILS
rewound or repaired without delay.

'Phone: 5773 Holborn. MACDONALD, SYER & CO., LTD., 295, Gray's Inn Road, W.C. 1. 8485

MOTOR GENERATOR.

MOTOR Generator, 220—110 V., 100 amp., 4 H.P., D.C. Motor. Totally enclosed, series wound, suitable for Crane or Haulage, 200—250 V.

"ROBUST MACHINERY,"
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TRADE RATES ON APPLICATION.

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BELLS.—Three 10″ single stroke Aston Blue, two 6″ ironclad trembling.—PROTECTOR CO., Central Hall, Southall. 4883

CROMPTON Rotary Converter, 230 volts to 60 volts, 25 amps. Complete with starter and resistance.—BOYS, Featherstone Buildings, W.C. 1. 4935

D.C. Recording Voltmeter, by Nalder, in iron case, 0/600 volt. Perfect; just re-calibrated by Maters. Also 100-amp., 440-volt B.O.T. Meter, by Chamberlain, new 1914.—DRUMMOND AND CO., Middlesbrough. 4954

DETECTOR Galvanometer and Current Direction Indicator, in polished wood case, £2.—KING & SON, Bicester, Oxon. 1891

DYNAMOS, 75 v., 70 a., 4-pole, £55; 50 v., 30 a., enclosed B.T.H., £21; Switchboard, £5; Dynamo, 25 v., 25 a., £10 10s.; Dynamo, 25 v., 6 a., £4.—4975, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DYNAMOS, 200/250 v., 21, 48, 60, 82, 98, 180, 450, 650 amps.; Dynamos, 110 v., 12, 20, 26, 40, 50, 60, 70, 90, 120, 136, 220 amps.—4974, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DYNAMOS, 3000, 1500, 1000 and 750 amperes at 6 volts; also smaller sizes. Apply for lists.—CANNING & CO., Electro-Platers Engineers, Birmingham. 7769

ELECTRIC Motors and Dynamos, Sale or Hire. Always a large stock of nearly new guaranteed machines. Immediate delivery.—ELECTRO-GENERATOR CO., 1A, Shepherd's Bush Road, W. 'Phone: 488 Hammersmith. 4723

ELECTRIC Motors for sale, A.C. and D.C.; good numbers in stock; immediate delivery.—SUGDEN, Wakering Road, Barking. 4915

FOR Sale, Castle Dynamo, 105 volts, 220 amps. Perfect running order.—E. A. HALL, Old Market Place, Grimsby. 4861

FOR Sale Crompton Dynamo (shunt), in good condition, 100 to 135 volts, 30 amps., 1,020 revs.—MICKLEWRIGHT, Medway Street, Maidstone. 4820

FOR Sale, D.C. Motors, 10 H.P., 480 volts; 9 H.P., 520 volts; 7½ H.P., 500 volts. Immediate delivery.—WILLIAMS & SONS, 37, Queen Victoria Street, London. 1869

FOR Sale, immediate delivery, 400-I.H.P. Paxman compound Steam Engine with ejector condenser.—SLOUGH & DATCHET ELECTRIC SUPPLY CO., LTD., Peascod Street, Windsor. 1929

FOR Sale, Motor-Generator, comprising 440-volt, D.C. Motor, coupled to 150-KW., 550-volt Generator (little used).—1904, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, one 10-H.P., 110-V., 1,000-R.P.M., D.C. Motor.—MACDONALD, SYER & CO., LTD., 295, Gray's Inn Road, W.C. 1889

FOR Sale, two 30-H.P. 230-volt, 1300-R.P.M., protected type, shunt-wound Motors. Cheap.—PHŒNIX ELECTRICAL CO., 32—36, Broomielaw, Glasgow. 1902

FOR Sale. We have always a large stock of A.C. and D.C. Motors, all guaranteed machines.—Send your enquiries to C. J. FERGUSON & SONS, 54, Chiswell Street, E.C. 1. 1934

FOR Sale, 2-phase Motor, 100 B.H.P., 475 R.P.M., 200 or 400 volts, 50 cycles. Noted make, practically new.—Apply, WINDER, Cross Belgrave Street, Leeds. 1391

FOR Sale, 8-H.P., 200-volt, 50-cycle, 2-phase Slip-ring type Motor. Price £40.—THE PHŒNIX ELECTRICAL CO., 32—36, Broomielaw, Glasgow. 1804

FOR Sale, 10 H.P. D.C. Motor, by the G.E.C., 480 volts, 950 R.P.M., with starter, pulley and slide rails.—WILLIAMS & SONS, 37, Queen Victoria Street, London. 1870

FOR Sale, 20, 30 and 50-KW. Balancers for 240/480-volt three-wire system.—PHŒNIX ELECTRICAL CO., 32—36, Broomielaw, Glasgow. 1899

FOR Sale, 26-B.H.P. Crossley Gas Engine with tanks, piping, &c. Newton Dynamo, 100/140-volt, 120-amp. Hendry belt and usual switchboards. Can be seen running by appointment.—WARINGS & GILLOW, LTD., Electrical Department, 164, Oxford Street. 4969

FOR Sale, 30-volt, 150-ampere Plating Dynamo; cheap.—PHŒNIX ELECTRICAL CO., 32—36, Broomielaw, Glasgow. 1900

FOR Sale, 57½-KW., 110-volt, 600-R.P.M., Westinghouse direct-current Generator.—PHŒNIX ELECTRICAL CO., 32—36, Broomielaw, Glasgow. 1903

(Continued on next page.)

FOR SALE.—*Continued.*

FOR Sale, 70-H.P. Compound-wound D.C. Electric Motor, by the Lancashire Dynamo and Motor Co., 500 V., 500 R.P.M.; 5-H.P., D.C. Electric Motor, by Mawdesleys, Ltd., Shunt-wound, 100 volts, 1050 R.P.M.; 6-H.P., D.C. Electric Motor, by Newtons, No. 17270, Shunt-wound, 100 volts, 1000 R.P.M.; one D.C. Booster, 50 volts, Series-wound, 15 KW., 525 R.P.M., with half-coupling and extended base.—STANLEY ENGINEERING CO., Bath. 1894

FOR Sale, 70-volt, 70-ampere, 550-R.P.M., six-pole, compound-wound Generator, by E.C.C.; price £56.—THE PHŒNIX ELECTRICAL CO., 32—36, Broomielaw, Glasgow. 1805

FOR Sale, 75, 37, 25-H.P., Motors, 2-phase, 200-volt, 950 R.P.M. Good condition; may be seen running.—1922, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, 80-H.P., 440-volt, 25-cycle, 720 R.P.M., 3-phase, Slip-ring type Motor, complete with control gear; also 100-H.P., Squirrel-cage type ditto.—THE PHŒNIX ELECTRICAL CO., 32—36, Broomielaw, Glasgow. 1803

FOR Sale, 220-volt, 190-ampere, 440-R.P.M., two-pole, shunt-wound three-bearing Generator, by Mavor & Coulson; of old type, but good for many years' service. Price £75.—THE PHŒNIX ELECTRICAL CO., 32—36, Broomielaw, Glasgow. 1806

FOR Sale, 240-volt, 50-period, three-phase, Slip-ring Motors, 45 H.P., 960 R.P.M., and 80 H.P., 1440 R.P.M., complete with starters.—PHŒNIX ELECTRICAL CO., 32—36, Broomielaw, Glasgow. 1901

FOR Sale, 500-H.P., 460-volt, 150-R.P.M., three-bearing compound-wound Motor; also a 220-H.P., 240-R.P.M., Ditto. Specification and print on application.—THE PHŒNIX ELECTRICAL CO., 32—36, Broomielaw, Glasgow. 1905

GARDNER 5-H.P. Vertical Paraffin Engine for Sale; H.T. Magneto ignition; £55. New condition. Also Horizontal Petrol Engine, 1½ H.P., magneto ignition; £22.—A. RUSHWORTH, Chigwell Row, Essex. 4982

JOB lot, Electric Light Cable, vulcanized rubber, insulated and taped, suitable for aerial or tunnelling work, 1/18, 3/22, 3/20, 7/22, 7/20, 7/18, 7/16, 7/14. To be cleared, cheap.—LAKE, 132, Upper Thames Street, London. 1868

LAMP Caps on sale.—50,000 selected metal filament Lamp Caps suitable for re-manufacture.—HAMPSONS, 141, Higher Cambridge Street, Manchester. 4929

MOTOR, Thomas Parker, Ltd., D.C., 480 V., 4 B.H.P., 1400 revs. size 2, No. 5237; starter and main switch. Good working condition.—Particulars, FRIEND & SON, Electrical Engineers and Contractors, Avenue Road, Ilfracombe. 4933

MOTOR, 70 H.P., 440/500 volts, D.C., 200 R.P.M., with starting panel.—MARTINS, 320, Witton Road, Birmingham. 4913

MOTOR-Generator (Crypto), 400/460 V., D.C., to 60/70 V., 60 A.; 12-H.P., 230-V., 4-pole Motor; 8-H.P., 480-V., 4-pole Motor; ¾-H.P., 220-V., £12; 1½-H.P., 220-V., £16 10s.; 1-H.P., £15; ½-H.P., £8.—4977, ELECTRICAL REVIEW, 4, Ludgate Hill, London

MOTOR-Generator, 440/60 volts, 80 V., 80 amperes, with stator and shunt regulator.—THE FARAD ELECTRICAL CO., LTD., Farad House, West Hill, Wandsworth. 4961

MOTOR-Generator, 460 to 110 volts, 300 amps., single armature type; only used for experimental purposes and as new.—DRUMMOND & Co., Middlesbrough. 4894

MOTORS, 5-H.P., 230 V., £32 10s.; 100-H.P., 230 V.; several 3 to 10-H.P., 460 V., Motors cheap; Starters to 150-H.P.; Voltmeters, Ammeters, 35 Accumulators. Dynamo 110 V., 135 A., £50, bargain.—4979, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ONE Electric Motor, size 5, semi-enclosed type, shunt wound, 250 volts, 7 B.H.P., 900 R.P.M., continuous rating; slide rails, with belt-tightening gear and pulley, 6" × 6". Also a Motor Generator Set. Machines Nos. 1523 and 1524. One size 5 Motor, shunt wound, protected type, 100 volts, 1250 R.P.M., continuous rating. One size 5 Generator, shunt wound, protected type, 285 volts, 25 amperes, 1250 R.P.M., continuous rating. Made by the Lancashire Dynamo & Motor Co., Ltd. All in excellent condition. What offers?—4817, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ONE 200-KW. Steam Generating Set for immediate sale, Willans-Mather & Platt, 220 or 440 volts. Perfect working condition.—JENNINGS, West Walls, Newcastle-on-Tyne. 1513

PLATING Dynamos, 50, 100, 200, 3600 amps.—4976, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TELEPHONES.—One complete set 5-way; one ditto 10-way; one ditto 20-way; one ditto 30-way, 10 single way. Sterling and General Electric make, good as new.—PHOTECTOR CO, Central Hall, Southall. 4884

THE Rhymney Valley & General Electric Supply Co., Ltd., have for disposal the following plant, &c.:—Two Westinghouse 40-KW. and 10-KW., 500/224 volts, three-phase, 50-period, oil-cooled transformers, each fitted with voltage regulators; one Westinghouse 2-H.P., 230-volt, three-phase, 50-period, 940 revs., S.C. motor with starter; one Brooks, Ltd., 2-H.P., 400 volts, three-phase, 25-period, S.C. motor with starter; 24 130-volt, 50-period, single-phase, house service meters; a large quantity, slightly used, 130-volt metallic filament lamps.—Offers to the RESIDENT ENGINEER, Bank Chambers, Bargoed, South Wales. 4815

FOR SALE.—*Continued.*

TRANSFORMER, 30 KW., 440 volts, three-phase, to 110 volts, single-phase, 50-period. Price £70, free on rail.—4881 ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TWO Double-Tariff Meters for Sale, by Chamberlain & Hookham, 220 volt, 100 amp. C.C., in first-class working order. What offers?—RAYNERS, 61, Hampstead Road, N.W. 1 4948

TWO 250-KW. Belliss Alternator Sets, each comprising a Compound Enclosed Engine, with E.C.C. Alternator, 3000 volts, 50 periods; quite modern, and for immediate delivery.—HARRY H. GARDAM & Co., LTD., Staines. 1852

2-H.P., 530-volt, 1,000 rev. (Maudsley), with bedplate and starter; 1½-H.P., 480-volt (Cutting); ½-H.P., 480-volt, 1,600 rev.; 1-H.P., 200-volt, 50-cycle, with starter; ½-H.P., 200-volt, 50-cycle, with starter: ½-H.P., 100-volt, 50-cycle; all in first-class condition.—BOYS, Featherstone Buildings, W.C. 1. 4936

10-H.P., 2-phase Motor, 200 V., 50 ~, complete (Ingleby, Leeds), £47 10s., bargain; 20-H.P. and 30-H.P. ditto: several 220-V., 3-phase Motors, 50 ~, to 18-H.P., cheap.—4978, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

25-H.P. Star-delta Oil-immersed Starter, by Ellison, with double automatics, 440/500 volts. Just unpacked.—DRUMMOND AND Co., Middlesbrough. 4953

30-H.P., 420-volt, D.C., Motor, with pulley and rails. Speed 620. Can be seen running in the Midlands.—1881, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

44-KW., 110-volt D.C. Generator, compound wound, three-bearing type, with rope pulley and slide rails; speed, 600.—DRUMMOND & Co., Middlesbrough. 4895

70-VOLT, 300-amp. Bipolar, Compound-wound Dynamo, by Holmes; speed, 900; perfect order.—DRUMMOND & Co., Middlesbrough. 4893

75/80 KW. Generator. Immediate delivery. 230/250 volts, 800/850 revs. Compound wound, three bearings.—MAVOR AND COULSON, LTD., Glasgow. 1771

100-H.P. Gas Engine (National) and Suction Gas Plant; can be seen running by appointment. 50-H.P. Motor, 875 R.P.M., 440/60 volts (by Swedish General Electric Co.).—THE FARAD ELECTRICAL CO., LTD., Farad House, West Hill, Wandsworth. 4960

500-KW. Steam Set, comprising triple-expansion enclosed engine, coupled to Westinghouse multipolar generator, 440/490 volts, D.C. For prompt delivery.—HARRY H. GARDAM AND Co., LTD., Staines. 1413

500-KW. Steam Generating Set, comprising a Belliss triple-expansion engine, coupled to an alternator by the Electric Construction Co., Wolverhampton, 3000 volts, 50 periods, with Wheeler-Worthington independent surface condensing plant; modern plant in first-class condition, and for immediate delivery.—HARRY H. GARDAM & Co., LTD., Staines. 1851

ARTICLES WANTED.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.).
Box Number and ELECTRICAL REVIEW address count as seven words.

ACCUMULATORS wanted for refining purposes. Obsolete Generating Sets, Dynamos, Motors, and all kinds of Machinery. Scrap Cable, Arc Lamps, Meters, Metal Residues, and Scrap Metals of every description purchased for prompt cash, town or country.—Apply A. BROWN & SONS, 142, Lower Clapton Road, London, N.E. Telephone: Dalston, 555. Telegrams: Secondhand, Lowclap, London. Established 1860. 4358

A.C. and D.C. Motors (second-hand), any type, any condition, wanted for prompt cash.—A. LEAROYD & SON, Bridge Works, Heatherley Street, Clapton, N.E. 4765

A. LEAROYD & SON, Bridge Works, Clapton, N.E.—Telephone Dalston, 2278; Telegrams: Frangible, Lowclap, London—buys for prompt cash every description of second-hand Generating Sets, Accumulators, Motors, Transformers, old Arc Lamps, Meters, Cable, Scrap Metals, Metallic Drosses, &c., &c. Enquiries solicited. Established over 50 years. 4766

A 1 CASH Prices given for Electric Cable, Flexible Wire, Electrical Accessories, &c.—Apply DAVIS, 11, Sun Street, E.C. 2. 1424

ALL for Munition purposes.—Obsolete Motors, Dynamos, Insulated Cable, and every description of Electrical Plant bought to break up. Send us your stocks of scrap metals.—G. H. CHAPPELL SONS & Co., Midland Wharves, Lea Bridge Road, Leyton, N.E. 'Phone:—Walthamstow 500. Estab. 40 years. 4707

(Continued on next page.)

ARTICLES WANTED.—*Continued.*

CABLE.—90 yards single 7/14's Bitumen Insulation or V.I.R. 2500-megohm, for underground.—Full details and price to 4945, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CAR and Vehicle wanted (Electric).—RATCLIFFE, Appleby Lodge, Rusholme, Manchester. 4949

DYNAMO, modern type, volts 100, amps. about 150, complete with slides, pulley and regulator. — Full particulars to GOLDSTON, Marefair, Northampton. 4941

DYNAMO, 110/160 volt, 30 amp., or nearest, semi-enclosed type, new or equal. Send full particulars.—4925, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DYNAMOS, Motors, Arc Lamps, Meters, Scrap Cable, Iron, Metals or Machinery purchased for cash in any quantities.—J. HYAMS, 11, Glengall Terrace, Old Kent Road, S.E. Telephone: 3339 Hop. 4505

ELECTRIC Flat Irons wanted, light weight, with regulators if possible, 100/110 volts, also 220/250 volts.—Fullest particulars to LEICESTER RUBBER CO., LTD., Leicester. 4924

ELECTRIC Light Set, 55 or 100 volts, paraffin or petrol driven, 2 to 3 KW., complete with battery.—Price and full particulars to GENT & CO., LTD., Faraday Works, Leicester. 4947

ELECTRIC Motors, A.C. and D.C., wanted.—SUGDEN, Wakering Road, Barking. 1761

MOTOR, 8 or 10 H.P., 460 V., D.C., about 1000 revs.—NORTHERN ELECTRICAL CO., Grimsby. 4892

MOTOR-Generator. Three-phase, 415/420, 50-cycle Motor, coupled to 100 KW., 100/120-volt D.C. Shunt Generator, preferably complete with starting gear, &c. New or second-hand. If second-hand must be in perfect condition.—1906, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

NEW or second-hand Motor wanted, from ¼ H.P. to 25 H.P., 230 revs., 460 volts, D.C.—4934, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

OLD Cable urgently required, also Lamp Tops.—WALLACE, Cromwell House, High Holborn. 4114

OLD Electric Lamps with glass intact.—104, Craven Park, London, N.W. 10. 4400

ONE 80/100-H.P. three-phase, Slip-ring Motor, suitable for 1000 volts, or, if lower voltage, with suitable transformer for 1000 volts down.—C. J. FERGUSON & SONS, 54, Chiswell Street, E.C. 1. 1935

PLATINUM, in any form and quantity, purchased at highest prices by DERBY & CO., LTD., 44, Clerkenwell Road, London.

TWO 5-H.P., 400-volt, three-phase, 25-period Motors; one 1-H.P., 230-volt, single-phase, 25-period Motor.—Condition and prices, &c., to the ENGINEER, Rhymney Valley & General Electric Supply Co., Ltd., Bank Chambers, Bargoed, South Wales. 4814

TWO 200/220-volt, D.C., 2-H.P., Motors, and one 400-volt, 2-H.P. In good order.—LOCKETT & CO., Dean Street, E.C. 4. 4823

WANTED, a few 400-volt, 50-cycle, 3-phase Motors, preferably slip-ring type, 5 to 35 H.P.—8133, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, a ¼th or ⅛th-H.P. Motor for polishing, 200 volts, 100 cycles, single-phase, alternating current. — Apply SIMMONS, 384, High Street, Cheltenham. 4923

WANTED, a 25 to 30-KW. Generator, 460 to 500 volts, complete with pulley and field regulator.—ELECTRICITY WORKS, Faversham. 4946

WANTED, Electric Drills, all kinds, three-phase and one-phase Motors, Friction Hoists.—4930, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, for direct-coupling to high-speed steam engine, 500 revolutions, 30/40 KW. Generator, any standard voltage, but preferably 220 D.C.—Reply, stating maker, price and full details, to 1639, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Generating Set, about 10 KW., 220 volts, gas driven, combined set preferred.—ALBERT INNES, 2, Albion Place, Leeds. 1919

WANTED, Generating Sets, A.C., 300 KW., 400 KW., 500 KW., in good condition. 3,000 volts, 50-period, 3-phase. Please state age, price and where to be seen.—1940, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Generating Sets, all sizes, Boilers, Accumulators, Dynamos, &c., for export: also Scrap Cable and Metals. Complete plants purchased.—WILLIAMS & SONS 37, Queen Victoria Street, London. Telephone: 3938 City. 7000

ARTICLES WANTED.—*Continued.*

WANTED, Good three-phase Motor, 10/15 H.P. squirrel-cage or wound motor, and suitable for 40-cycle, 440-volt supply.—State price and particulars to Box "O," Kidd's Advertising Agency, Middlesbrough. 4955

WANTED, House Electric Meter, 100 V., A.C., period 83, amp. 5—7.—Write W., 7, Nevern Place, S.W. 5. 4943

WANTED, Motors, 10 to 20 H.P., 500 volts, 25 cycles; also D.C. motor 40/50 H.P., 400 volts.—MCWHIRTER & SON (CARDIFF), LTD., Cardiff. 1886

WANTED, small Electric Light Plant for country house. New or second-hand. Lowest offers.—Reply to Z. B. 966, care Deacons, Leadenhall Street, E.C. 3. 4937

WANTED, Steel Chimney, diameter 3 to 5 ft., height about 80 ft.—Full particulars to KRYN & LAHY METAL WORKS, LTD., Letchworth, Herts. 1849

WANTED to Purchase an Electric Motor, new or second-hand, about 3 H.P., 220 volts, 40 cycles, 3-phase. State price and full particulars.—Address POINTING, Hexham-on-Tyne. 1824

WANTED, two A.C. Motors, 110 volts, 60 periodicity, 20/30 H.P., single phase. — Particulars to CRYSELCO LIMITED, Kempston Works, Bedford. 1826

WANTED, two 200-amp. S.P. Circuit Breakers, 440 V., double automatic, with time lags and lightning arresters. Also 10-H.P. D.P. Circuit Breakers.—D. A. WARD, Northgate, Dewsbury. 4984

WANTED, vertical compound high-speed Engine, 80/100 H.P., enclosed, self-lubricating type, by well-known maker preferred. Send price and full details, to 1638, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, 25 or 50-volt Dynamo, output about 1000 watts.—4968, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, 110-V. Generator, 55 to 75 amps. Also 220-V., 20/25 KW.; 220-V., Motors, ½ H.P.; 440-V. Motors, 3/30 H.P. —Price and particulars, WARD, Northgate, Dewsbury. 4891

7 MOTORS required for 460 volts, D.C.; one 10 H.P., one 7 H.P., three 5 H.P., two 1 H.P.—Write H. ROGERS, Electrical Engineer, Friars Gate, Warrington. 1829

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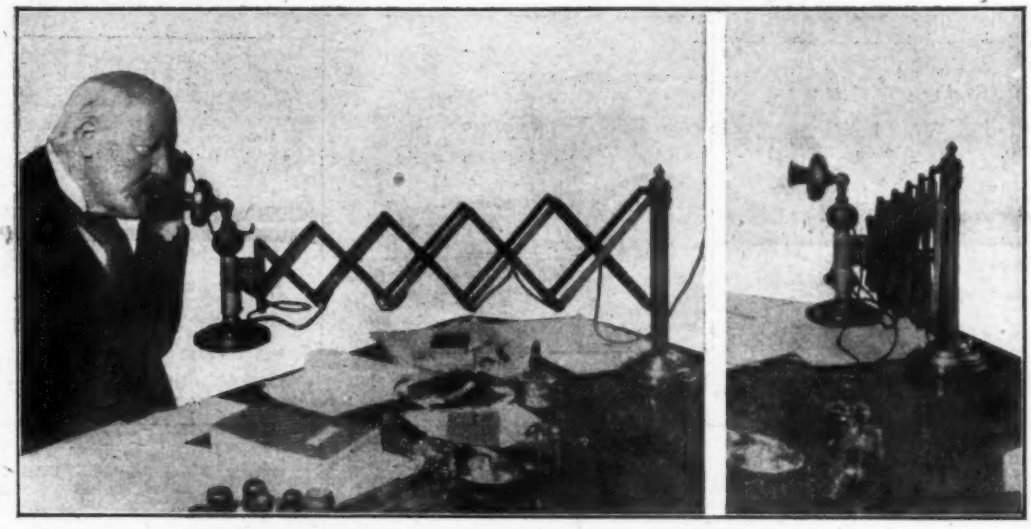

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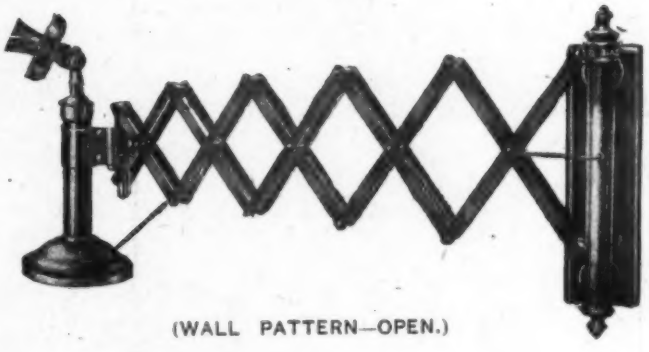

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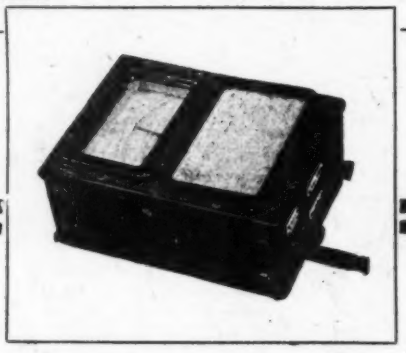

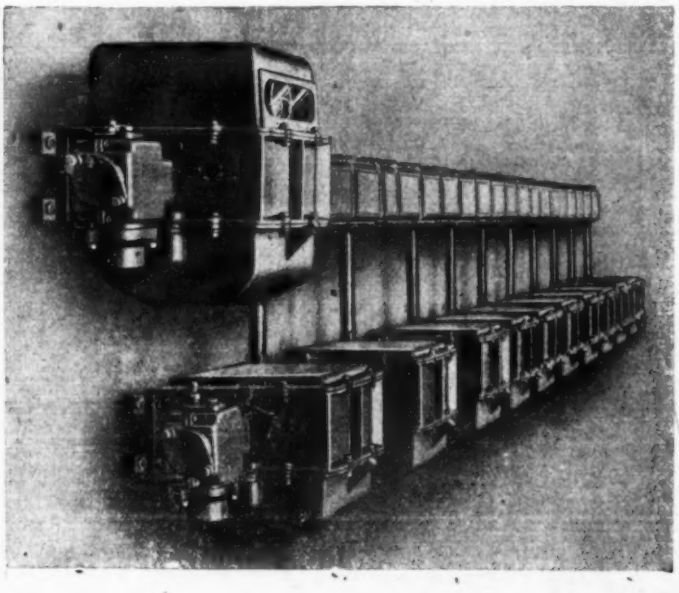

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NOTICES RELATING TO PATENTS.

Latest time for receiving 9.30 a.m. Thursday.

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THE COUNCIL of the Chartered Institute of Patent Agents, by a resolution of the 4th day of June, 1918, authorised Fellows of the Institute to make, as from the 30th June, 1918, an additional charge of 10 per cent. on the Scales of Fees recommended by the Council, to cover the additional expenses they have to incur in consequence of the war.

H. HOWGRAVE GRAHAM,
Secretary and Registrar. 1890

OFFICIAL NOTICES.

Latest time for receiving 9.30 a.m. Thursday.

CORPORATION OF DUBLIN.

Supply of Coal Crusher.

THE ELECTRICITY SUPPLY COMMITTEE of the Corporation of Dublin invite Tenders for the Supply and Installation at their Pigeon House Works of a Coal Crushing Plant of a capacity of approximately 40 tons per hour. Full particulars, Specification and General Conditions, and Form of Tender, may be obtained from the CITY ELECTRICAL ENGINEER, Pigeon House Works, Dublin, on and after THURSDAY, JUNE 27th, 1918.

Tenders, sealed and endorsed "Tender for Coal Crusher," must be addressed to "The CHAIRMAN, Electricity Supply Committee, Lord Edward Street, Dublin," and delivered there not later than noon on THURSDAY, JULY 4th, 1918.

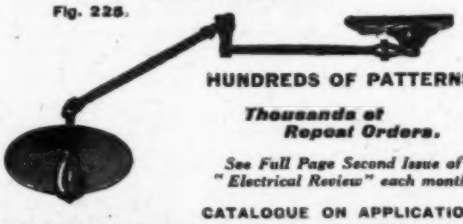
The Committee do not bind themselves to accept the lowest or any Tender.

FRED. J. ALLAN,
Secretary.

Electricity Supply Committee's Offices,
Lord Edward Street,
June 22nd, 1918. 1885

DUGDELL'S PATENT MOVABLE FITTINGS.

Fig. 225.



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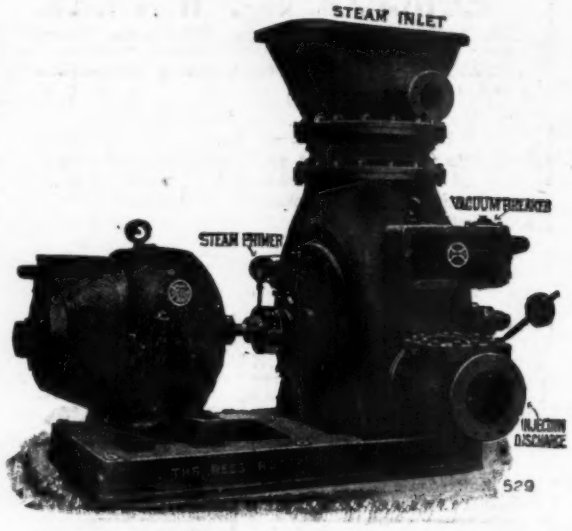

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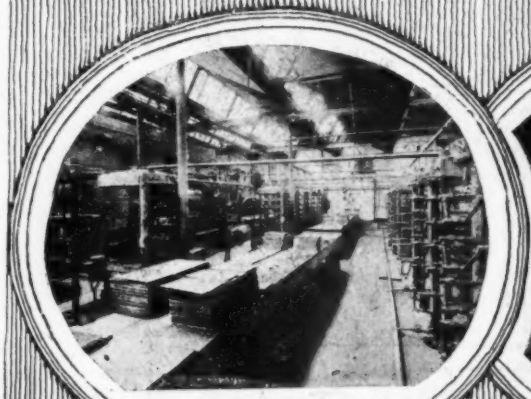

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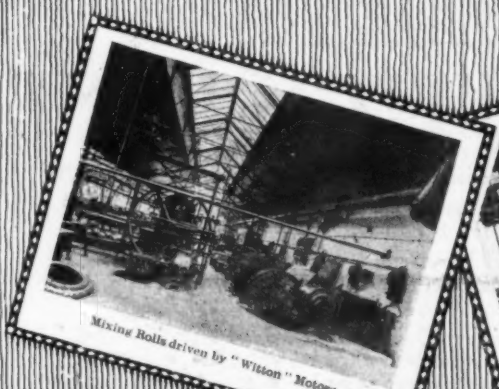

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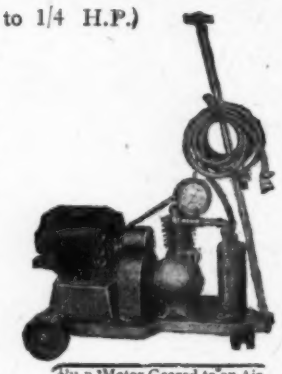

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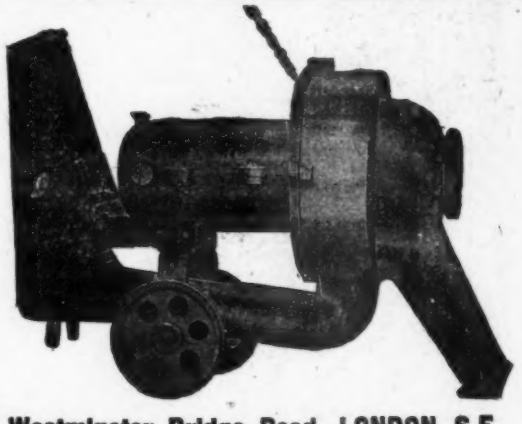

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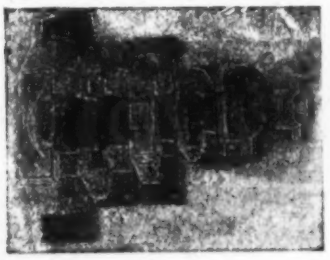

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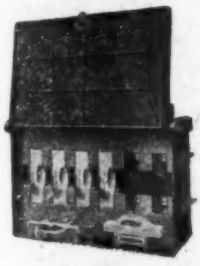

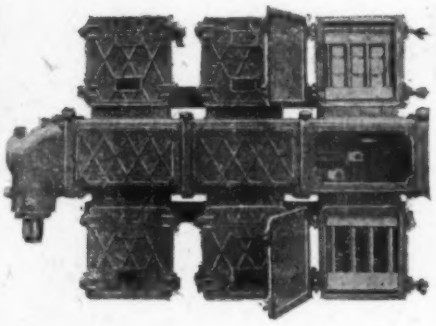

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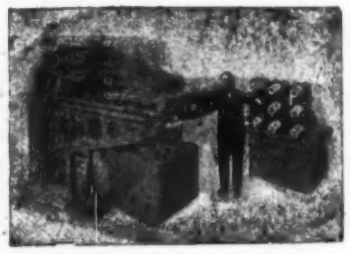

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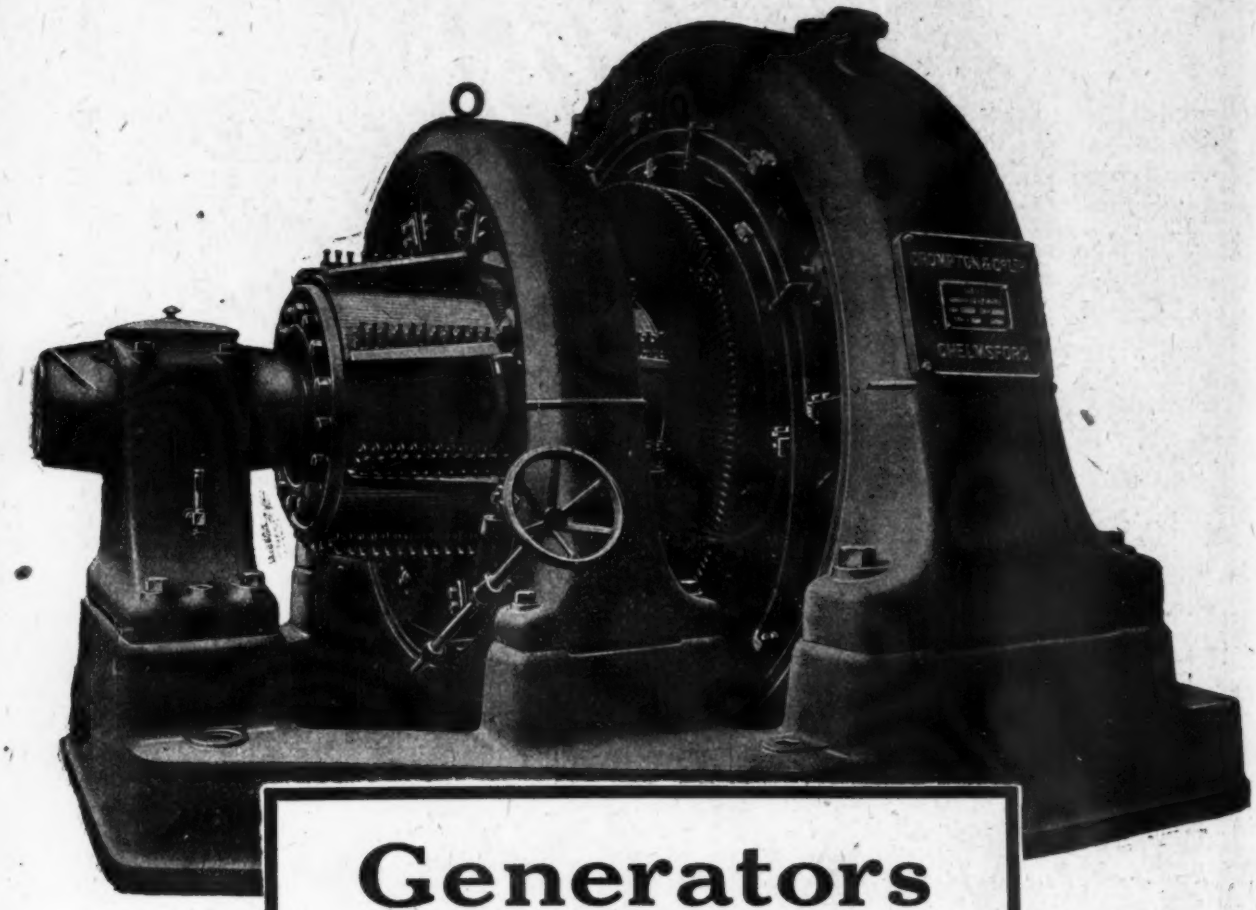

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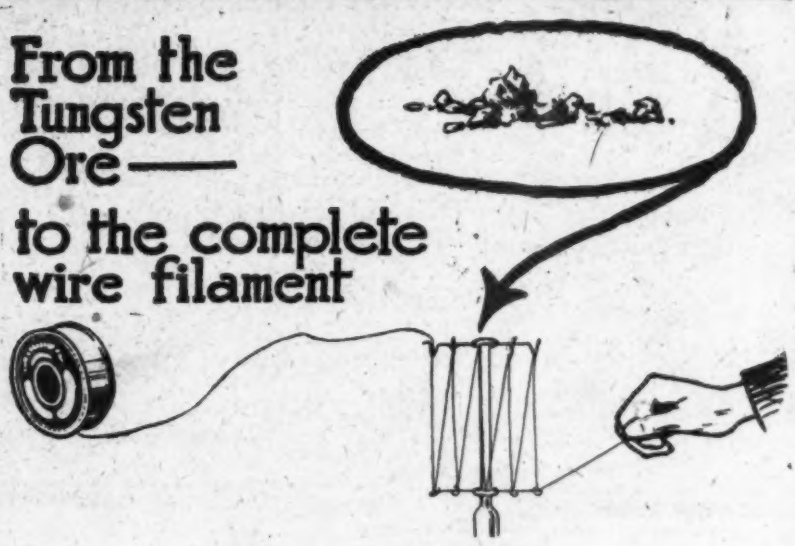

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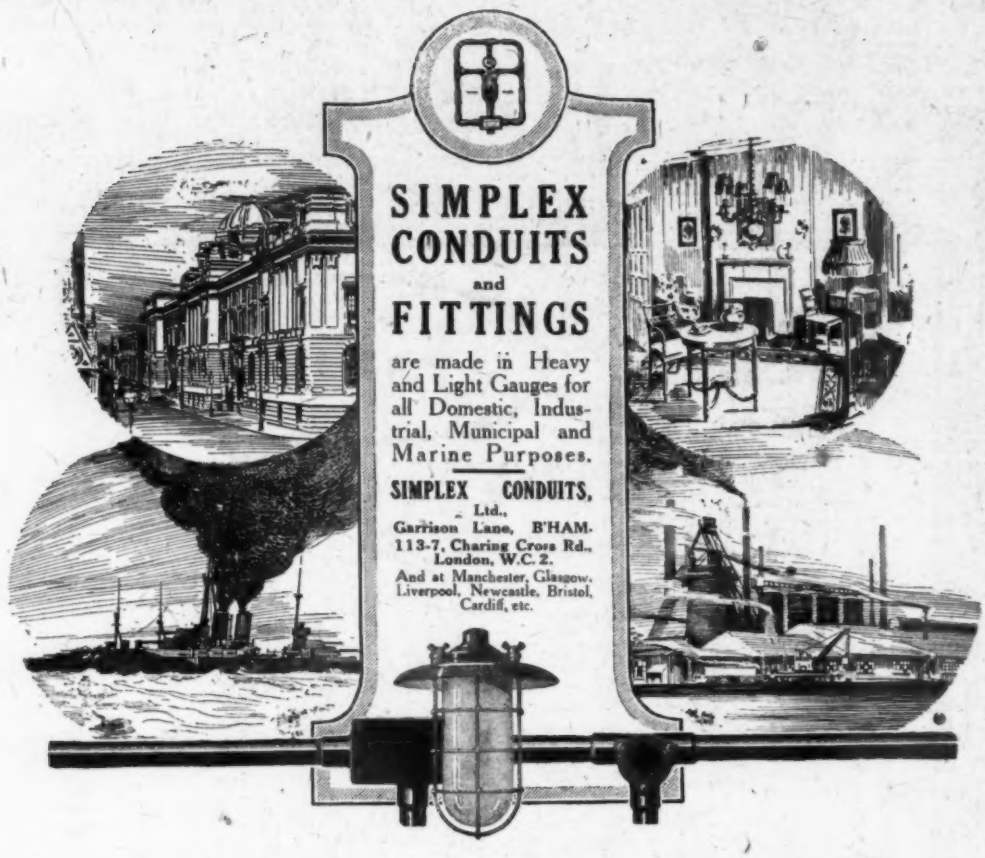

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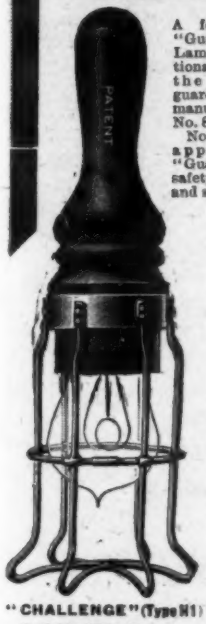

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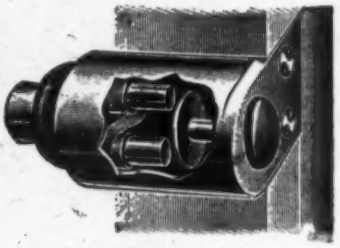

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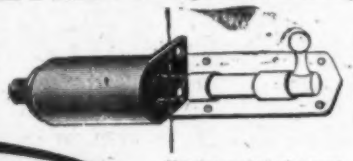

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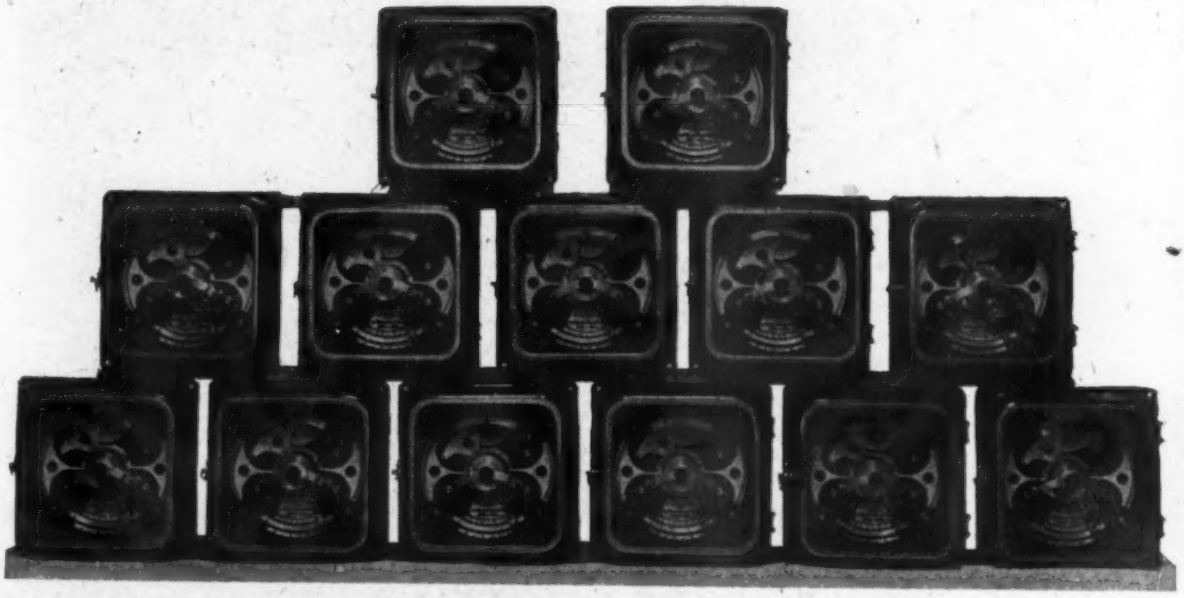

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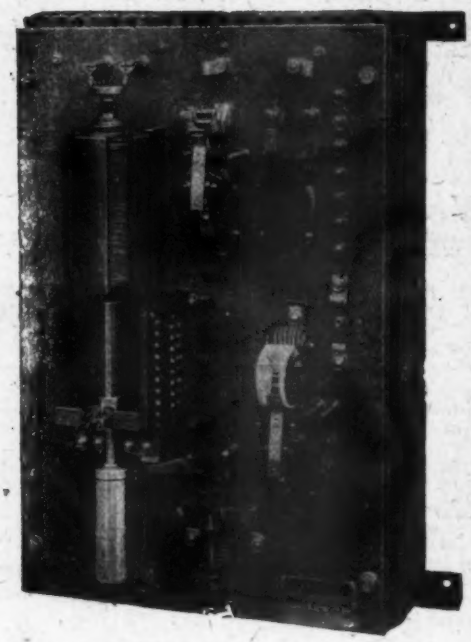

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THE "Igranic" Patent System of Compensated Solenoid Control enables this to be positively and easily done from the worker's ordinary position at the tool.

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This space is open fortnightly for the insertion of verses that may be of use in helping some of us to realise the present urgent needs of our beloved country.

Contributions are invited that will not infringe the Copyright Act.

Address: Manager, Cable Works, Warrington.

No. 10.

THE LAW OF THE KAISER.

Now this is the law of the Kaiser,
As old and as true as the sky;
And the Hun that shall keep it may prosper,
And the Hun that shall break it must die.

If ever civilians offend ye,
Be it woman or child or old man,
Kill just for the pleasure of killing,
Aye, kill just whenever ye can.

Respect not your enemy's country,
Drink deeply and eat like a brute—
And remember the night is for murder,
And forget not the day is for loot.

Spare nothing, not even cathedrals,
Remember the name ye have won,
Remember the Huns of Attila,
Live up to the proud name of "Hun."

And ye who go down in the U-boats,
Take care that ye never save lives,
Make sure of the toll of your victims,
Sink! sink! and make widows of wives.

And ye who make air raids on England,
Remember the Rule of the Air,
Is to kill, and if women and children
Are there—well, they shouldn't be there.

Now these are the Laws of the Kaiser,
And many and mighty are they,
And the End of the Law and Beginning,
And Beginning and End is—Obey!

From "Quite-So Stories," by W. HODGSON BURNET.

The New Lighting Order

HALO

The problem of how to meet the Governments order by reducing the Lighting Consumption without necessarily reducing the Number of Lamps.

Your Customers will have a big problem to consider when they are compelled to restrict their consumption of Electricity in compliance with the requirements of the Government for the saving of fuel.

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Lower Candle-Power Lamps can be used and yet retain the maximum amount of light required.

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Accumulator," Manchester or Glasgow
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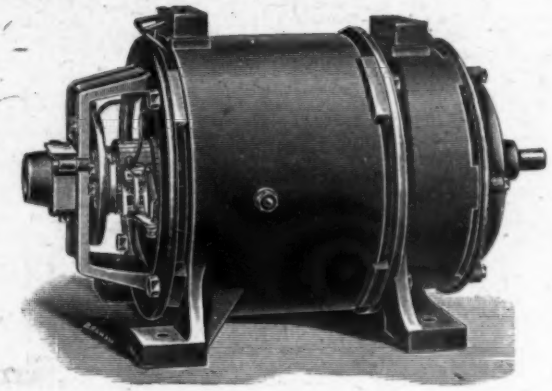
We can give prompt delivery of Crypto Combined A.C. to D.C. Motor Generators for War Material.



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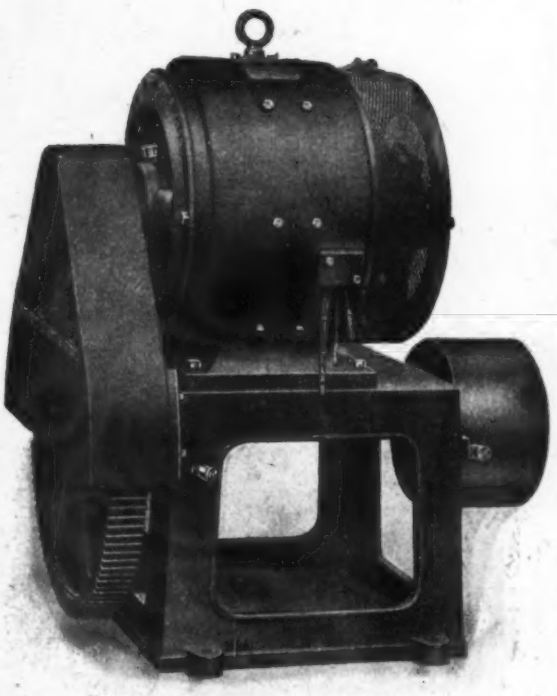

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CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ARMAGH.—Cold storage plant, for the Asylums Board.

AYLESBURY.—Premises, Bicester Road, for J. Putman. Fire-engine house, for the Bifurcated & Tubular Rivet Co.

BALLYMENA.—Town hall; Surveyor to Council.

BINGLEY (YORKS.).—Alterations to Royd House, Wilsden; Clerk to U.D.C.

BOSTON.—Sawmill, High Street, for L. Roper.

BRIGHTLINGSEA.—Extensions to shipbuilding yard, for Aldous, Ltd.

CHALFORD (GLOS.).—Alterations to factory, for the Woodworkers' Co., Ltd., Bliss Mills.

CHESHAM BOIS (BUCKS.).—Premises (£2,000), for H. J. Pike.

CONVOY (CO. DONEGAL).—Flax mill; Borough Surveyor.

GLASGOW.—Additions to works, for W. Beardmore & Co., Ltd., Parkhead. Tool store, for D. & W. Henderson & Co., Ltd., Meadowside Works, Partick. Additions, dye shed, for J. Lyle & Co., Ltd.

GREENOCK.—New church and hall for Old West Kirk; the Minister.

HANLEY.—Rebuilding premises, Lichfield Street, for Bullers, Ltd.

INCE (LANCS.).—Sawmills, for J. Heaton & Son, Wigan.

JOHNSTOWN (WREXHAM).—Sawmills, for I. Jenkins, Ltd.

LEWES (SUSSEX).—Re-erection of the "Bear" Hotel, for the Southdown and East Grinstead Breweries, Ltd. Corn stores, for Messrs. Strickland and Messrs. Stevenson.

MAINHEAD (DEVON).—Residence, for A. Newlyn.

MORECAMBE.—Extensions to premises, 15 & 17, Claremont Road, for R. Hartley.

RUSHDEN.—Engine house at factory, for H. E. Wilmott & Co.

SANQUHAR.—Factory, for Scottish Co-operative Wholesale Society, at Kirkconnel; the Secretary, Glasgow.

SHERE (GUILDFORD).—Sawmills, for R. Downing (£2,000).

SILLOTH (CARLISLE).—Extensions to flour mills, for Carr & Co.

STRETFORD.—Shed in Westinghouse Road, for Rubber Regenerating Co., Ltd. Additions, Lund Street, for Newton, Harper & Co., Ltd. Additions, Prestage Street, for F. Duerr & Sons.

TARLETON (NEAR PRESTON).—Schoolroom, Hesketh Lane, for Buttersworth and Scorer.

THIRSK.—Extension of offices, for the B. of G.; the Clerk.

TROWBRIDGE.—Alterations, "White Hart" Inn; the Licensee.

WALKDEN.—Electricity sub-station, for Burgess, Ledward & Co., Ltd.

WALSALL.—Laboratory at the hospital; Secretary.

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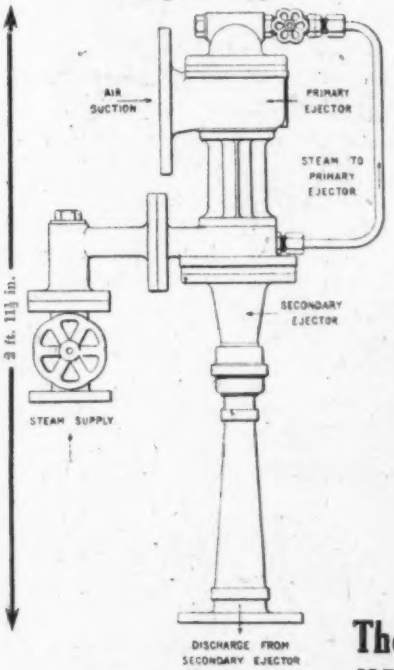

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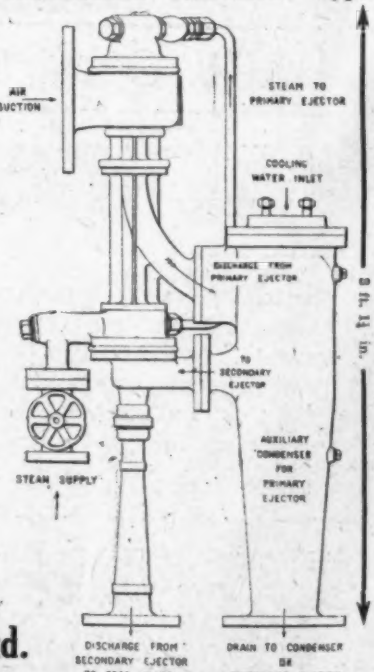
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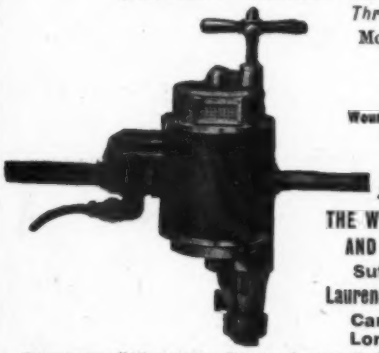

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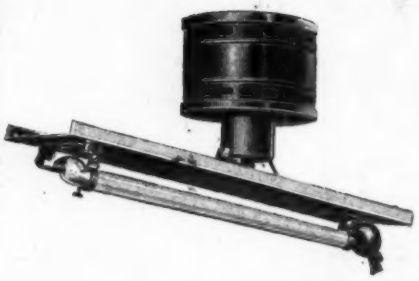

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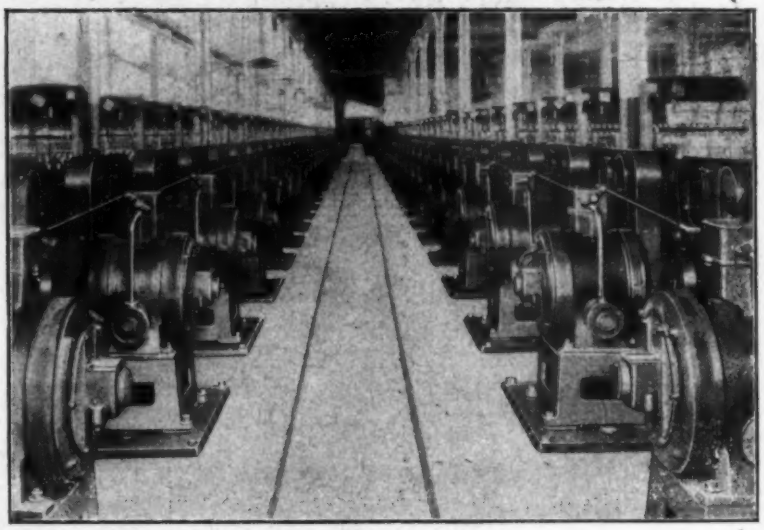

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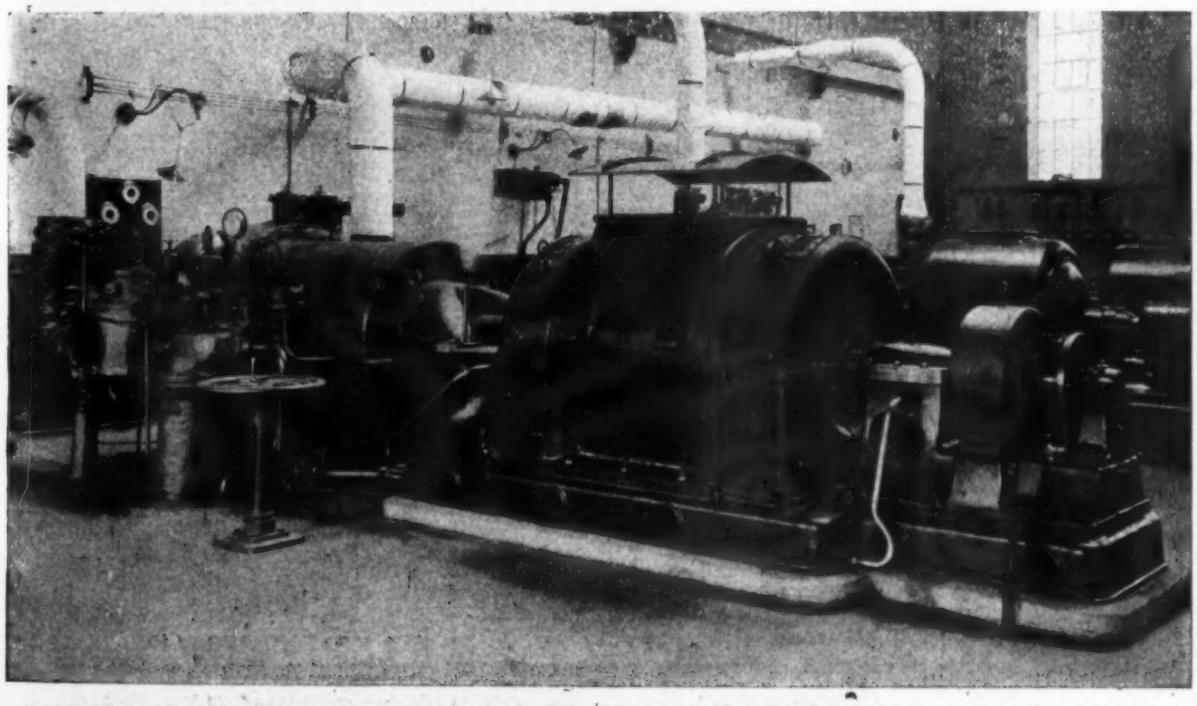

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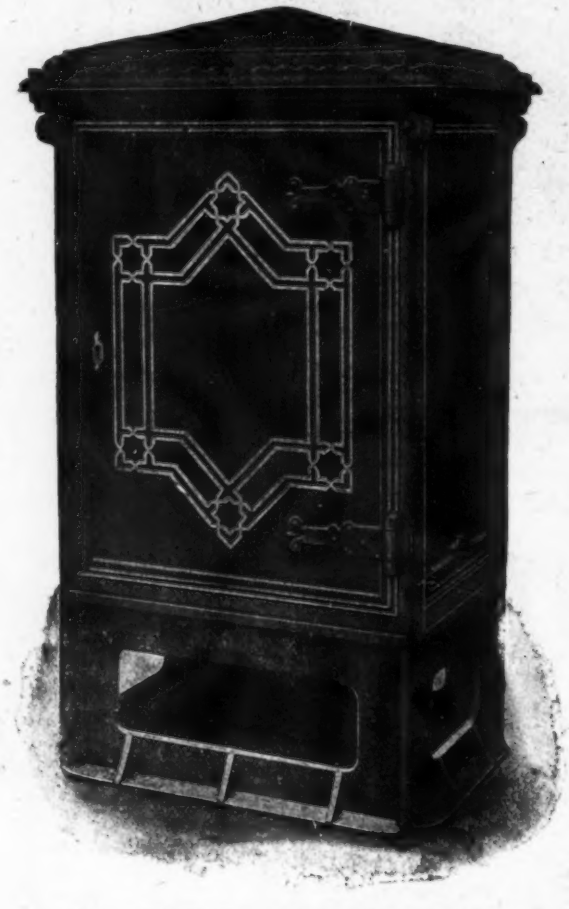

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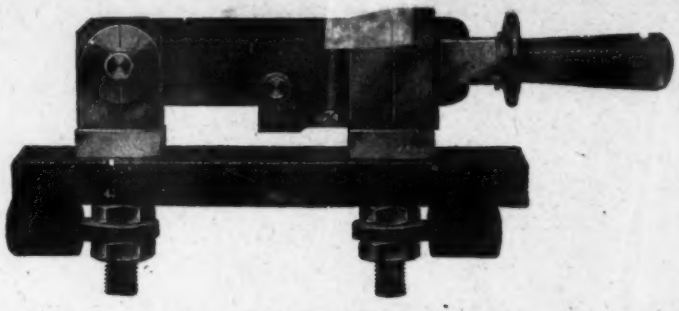

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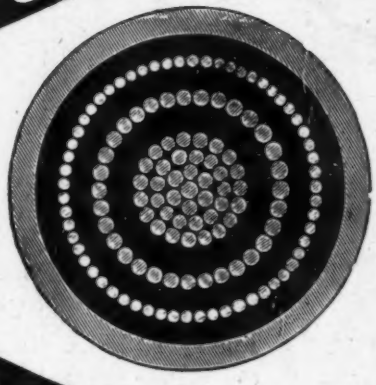

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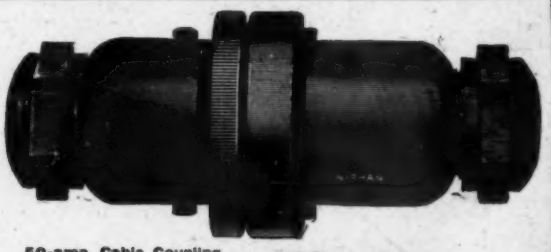

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